

METHODS/LABOR STANDARDS

0233

APPLICATION PROGRAM

PHASE IV

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JAN 1985		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE National Steel and Shipbuilding Company Methods/Labor Standards Application Program - Phase IV				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Surface Warfare Center CD Code 2230 - Design Integration Tools Building 192 Room 128 9500 MacArthur Blvd Bethesda, MD 20817-5700				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 247	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

NATIONAL SHIPBUILDING RESEARCH PROGRAM
THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS
SHIP PRODUCTION COMMITTEE
PANEL SP-8

NATIONAL STEEL AND SHIPBUILDING COMPANY
METHODS/LABOR STANDARDS APPLICATION PROGRAM - PHASE IV
FINAL REPORT
TASK ES-8-18

Submitted to:

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January, 1985

This project is managed and cost-shared by National Steel and Shipbuilding Company for the National Shipbuilding Research Program. The program is a cooperative effort of the Maritime Administration's Office of Advanced Ship Development, the U.S. Navy, the U.S. shipbuilding industry, and selected academic institutions.



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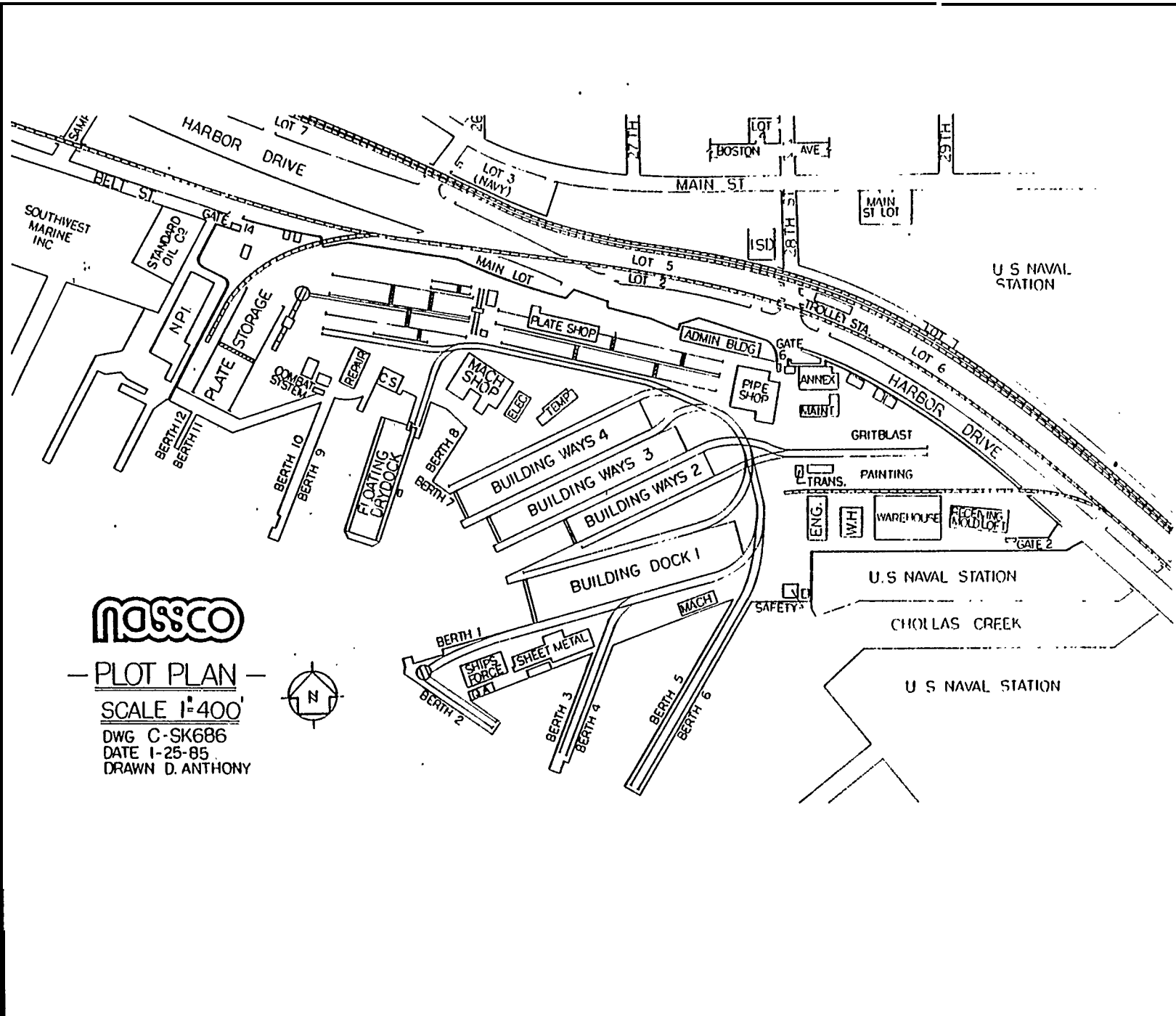
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FINAL REPORT
FOR
SNAME PANEL TASK ES 8-18

PREPARED BY
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JANUARY, 1985

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SECTION 2 - STANDARD PRACTICES & POLICIES

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2.1 CONSULT NASSCO'S GENERAL WORK MANAGEMENT MANUAL, SECTION
2, FOR STANDARD PRACTICES AND POLICIES,



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NATIONAL STEEL AND SHIPBUILDING COMPANY IS THE LARGEST SHIPBUILDER ON THE WEST COAST. IT IS A WHOLLY-OWNED SUBSIDIARY OF MORRISON KNUDSEN COMPANY OF BOISE, IDAHO. FOR THE LAST TEN YEARS, NASSCO HAS BEEN THE LEADING PRODUCER OF TANKERS FOR U. S. FLAG MERCHANT MARINE SERVICE DELIVERING OVER 40% (29 SHIPS) OF ALL NEW TANKERS BUILT IN THE UNITED STATES. NASSCO IS ALSO A LEADING PRODUCER OF U. S. NAVY AUXILIARY AND AMPHIBIOUS SHIPS. SINCE 1969 NASSCO HAS DELIVERED OR HAS CONTRACTED TO BUILD OR CONVERT 25 SHIPS FOR U.S. NAVY SERVICE.

NASSCO IS A FULL SERVICE REPAIR AND CONVERSION YARD FOR THE COMMERCIAL AND U. S. NAVY MARKETS, HAVING ACCOMPLISHED HUNDREDS OF OVERHAULS, RETROFITS, AND REPAIR JOBS ON ALL TYPES OF VESSELS INCLUDING NAVY COMBATANTS. A 1,000' x 176' GRAVING DOCK IS AVAILABLE FOR REPAIR WORK. A NEW 25,000 TON FLOATING DRYDOCK THAT IS 620' IN LENGTH AND 170' WIDE WITH 140' CLEAR BETWEEN WINGWALLS IS NOW IN SERVICE.

IN ADDITION TO SHIP RELATED WORK, NASSCO PROVIDES STEEL FABRICATION AND MACHINE SHOP SERVICES TO A WIDE VARIETY OF INDUSTRIAL CUSTOMERS IN THE SOUTHERN CALIFORNIA AREA.

NASSCO'S PRESENT SNAME PANEL SP-8 PROJECT OF THE APPLICATION OF ENGINEERED LABOR STANDARDS WITHIN SHIPYARDS HAS BEEN INDEED A TRUE RESEARCH AND DEVELOPMENT ENDEAVOR. OUR EFFORTS THIS YEAR HAVE BEEN TOTALLY IN NASSCO'S MAINTENANCE DEPARTMENT WHICH CONSISTS OF 139 PERSONS OPERATING ON A BUDGET OF OVER \$5,400,000. THE DEPARTMENT CONSISTS OF TWO MAJOR SECTIONS. ONE AREA IS ELECTRICAL MAINTENANCE, AND THE OTHER IS MECHANICAL MAINTENANCE. FURTHER DIVIDED IS MECHANICAL MAINTENANCE, WHICH SUPPORTS ALL MECHANICAL EQUIPMENT, AS WELL AS TRANSPORTATION. WE HAVE CENTERED



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OUR STUDY PARTICULARLY ON THE TRANSPORTATION MAINTENANCE AREA WHICH INCLUDES ALL ROLLING STOCK SUCH AS FORKLIFTS, SCOOTERS, MANLIFTS, TRUCKS, BUSES, AUTOMOBILES, AND CRANES.

"MAINTENANCE" REFERS TO ACTIVITIES THAT FIGHT DEFECTS IN EXISTING EQUIPMENT WITHOUT CHANGING THE DESIGN OF THE EQUIPMENT. MAINTENANCE ACTIVITIES COMPRISE LUBRICATION, CONSERVATION, LOOKING FOR DEFECTS, CLEANING, AND REPAIRING. MAINTENANCE IS A VERY CRITICAL COMPONENT OF OUR MANUFACTURING COMPANY. THE BASIC REASON FOR MAINTENANCE MANAGEMENT IS TO MAINTAIN AND IS TO PERFORM ESSENTIAL WORK WHILE CONTROLLING MAINTENANCE COSTS. WE ARE TRYING TO DO THIS BY INCREASING THE EFFECTIVE USE OF BUDGET AND PERSONNEL BY PROVIDING A MEANS FOR CONTINUOUS EVALUATION OF EQUIPMENT, MANPOWER REQUIREMENTS, AND, LAST BUT CERTAINLY NOT LEAST, ANALYSIS OF OPERATIONS AND PERFORMANCE.

ONE WAY FOR OUR TRANSPORTATION MAINTENANCE DEPARTMENT TO BECOME MORE EFFICIENT WAS BY INCREASING THE EFFECTIVENESS OF THE MAINTENANCE SUPERVISOR. TO DO THIS, HOWEVER, THE DEPARTMENT HAD TO SWITCH FROM THE USUAL PRACTICE OF BREAKDOWN MAINTENANCE (MAKING REPAIRS ONLY ON REPORTED DEFICIENCIES) TO PLANNED MAINTENANCE (PREVENTIVE AND CORRECTIVE MAINTENANCE WORK PERFORMED PRIOR TO BREAKDOWNS). ALSO, WE NEEDED THE USE OF A MAINTENANCE-MANAGEMENT CONTROL SYSTEM.

THE TERM "PREVENTIVE MAINTENANCE" MEANS "PERIODIC MAINTENANCE". EVEN THOUGH THE WORD "PREVENTIVE" TENDS TO DRAW ATTENTION TO THE GOAL OF THE ACTIVITY (PREVENTION) RATHER THAN TO THE ACTIVITY ITSELF (PERIODIC ACTION), WE EXCLUDE FROM THE DEFINITION OF PREVENTIVE MAINTENANCE ALL ACTIVITIES THAT ARE NOT CARRIED OUT ON A PERIODIC SCALE, EVEN WHEN THEY WOULD PREVENT OTHER DEFECTS AND ACCIDENTS.

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WE HAVE BEEN OPERATING OUR TRANSPORTATION PREVENTIVE MAINTENANCE GROUP FOR THREE YEARS. IT HAS DECREASED THE NEED FOR NEW TRANSMISSIONS AND HYDRAULIC PUMPS BY 90%. IT KEEPS MOVING PARTS IN WORKING CONDITION. IT IS INEXPENSIVE MAINTENANCE. AT THE PRESENT TIME, WE HAVE NO CONTROL OVER WATER PUMPS, BUT WE WILL START DRAINING AND FLUSHING RADIATORS ON A REGULAR PREVENTIVE MAINTENANCE BASIS WITH THE INTENT OF CUTTING DOWN RADIATOR PROBLEMS AND REPAIR COSTS. TO FURTHER ILLUSTRATE THE VALUE OF PREVENTIVE MAINTENANCE, NOTE THE FOLLOWING. IT COST APPROXIMATELY \$20 FOR A RADIATOR TO BE MAINTAINED WHILE IT COSTS \$250 PLUS DOWN TIME TO REPLACE A RADIATOR.

ALSO, WE HAVE ATTEMPTED TO FURTHER IMPROVE OUR EFFICIENCY WITH THE USE OF A MAINTENANCE-MANAGEMENT CONTROL SYSTEM.

OUR SHIP PRODUCIBILITY RESEARCH PROGRAM TASK ES-8-L8 (PHASE IV) PROJECT IS ACTUALLY THREE PHASES. PHASE ONE WAS TESTING A MICRO-COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM. PHASE TWO, OUR PRIMARY AND MOST IMPORTANT TASK, IS THE TRANSFER OF LABOR STANDARD DATA ACROSS THE INDUSTRY. PHASE THREE WILL BE A MANUAL PERFORMANCE RATING REPORTING SYSTEM UTILIZING OUR ENGINEERED LABOR STANDARDS THAT ARE THE RESULT OF OUR DATA TRANSFER.

ALTHOUGH NASSCO HAD A SEMBLANCE OF A COMPUTERIZED MAINTENANCE MANAGEMENT CONTROL SYSTEM FOR APPROXIMATELY SIX YEARS ON THE COMPANY'S MAINFRAME COMPUTER, FOR SEVERAL REASONS IT APPEARS MORE ADVANTAGEOUS TO USE A PERSONAL DEPARTMENTAL SYSTEM. OUR CHIEF OF MAINTENANCE AND MANAGER OF INFORMATION SYSTEMS SEARCHED FOR SEVERAL MONTHS. THE COMPANY THAT THEY FOUND WAS J. B. SYSTEMS WHICH HAS THE MAINSAVER SYSTEM.



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MAINSAVER IS AN OFF-THE-SHELF TURNKEY COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM. IT IS A PRODUCT WHICH IS A FUNCTIONAL TOOL FOR THE MAINTENANCE MANAGER. IT PROVIDES TOP MANAGEMENT WITH TIMELY AND COMPREHENSIVE REPORTS ON THE ACTIVITIES OF THE MAINTENANCE DEPARTMENT AND THE COST OF THOSE ACTIVITIES.

THERE ARE SEVERAL GOOD POINTS ABOUT THE MAINSAVER SYSTEM. THEY ARE:

1. IT IS AN ONLINE, DATABASE SYSTEM.
2. IT DOES NOT REQUIRE DATA PROCESSING PERSONNEL TO OPERATE THE SYSTEM, AND IS OPERATED BY THE MAINTENANCE PERSONNEL.
3. IT HAS THE CAPACITY TO CONTAIN THE MASTER EQUIPMENT LIST, THE INVENTORY LIST, THE PERSONNEL LIST AND THE PREVENTIVE MAINTENANCE REQUIREMENTS IN TERMS OF BOTH CALENDAR AND USAGE.
4. IT PRODUCES WORK ORDERS FROM BOTH PREVENTIVE MAINTENANCE REQUIREMENTS AND OTHER SCHEDULED WORK REQUESTS.
5. IT TRACKS AND REPORTS ON THE STATUS OF ALL OPEN WORK ORDERS.
6. IT ALLOWS MAINTENANCE MANAGEMENT TO FORECAST MANPOWER REQUIREMENTS FOR SCHEDULED AND PREVENTIVE MAINTENANCE FOR UP TO ONE YEAR.
7. IT CONTAINS ONLINE MAINTENANCE HISTORY BY EQUIPMENT FOR AT LEAST ONE YEAR.
8. IT TRACKS SPARE PARTS USAGE EQUIPMENT.
9. IT PRODUCES REORDER REPORTS TO BE USED BY PURCHASING TO ORDER SPARE PARTS AS NEEDED.
10. IT PROVIDES TOP MANAGEMENT WITH TIMELY AND MEANINGFUL REPORTS WHICH DESCRIBE THE ACTIVITIES AND COSTS INVOLVED IN RUNNING THE MAINTENANCE DEPARTMENT.
11. IT ALLOWS THE USER TO FORMULATE HIS OWN SPECIAL REPORTS.

12. IT PERMITS TELECOMMUNICATION LINKAGE BETWEEN THE MAINTENANCE COMPUTER AND THE COMPANY'S MAINFRAME.

IN SPITE OF THE MANY ADVANTAGES OF THE MAINSAVER SYSTEM, IT FAILED TO BLEND IN AND, THEREFORE, DID NOT WORK OUT SATISFACTORILY FOR US. THE PRINCIPLE PROBLEMS ENCOUNTERED WITH MAINSAVER WERE CAPACITY, AND MATCHING THE TURN KEY SYSTEM TO NASSCO'S EXISTING MAIN FRAME. TOO, IT WAS VERY INFLEXIBLE.

THE TIME NEEDED FOR EVERY SINGLE JOB OPERATION IN OUR MAINTENANCE TRANSPORTATION PREVENTIVE MAINTENANCE IS ESTIMATED FOR SEVERAL REASONS.

1. TO BE ABLE TO ESTABLISH WHETHER PREVENTIVE MAINTENANCE IS PROFITABLE.
2. TO BE ABLE TO HAVE THE NECESSARY PERSONNEL AVAILABLE.
3. TO BE ABLE TO ALLOCATE AN ADEQUATE DAY'S WORK TO PERSONNEL.
4. TO BE ABLE TO MAKE THE BEST USE OF LIMITED SHUTDOWN PERIODS.
5. TO HAVE A ROUGH MEASURE OF PERFORMANCE.

WE DO NOT USE THESE TIME ESTIMATES FOR WORK MEASUREMENT OR INCENTIVE SCHEMES. MANY OF OUR P. M. OPERATIONS CANNOT BE CHECKED CLOSELY ENOUGH. TOO, OUR WORKERS ARE EXPECTED TO DEAL WITH MINOR DEFECTS AS THEY ENCOUNTER THEM AND WITHOUT A SEPARATE ORDER HAVING TO BE ISSUED. WE DO NOT EXPECT OUR MAINTENANCE MEN TO HAVE A SEPARATE WORK ORDER FOR EVERY SINGLE INSTANCE THAT MAY OCCUR. THE PAPERWORK WOULD BE HORRENDOUS. IN PRACTICE, IT IS IMPOSSIBLE TO COVER BY PLANNING EVERY INSTANCE OF A JOB TASK.

THEREFORE, I HAVE DIFFERENTIATED, FOR MY PURPOSES, BETWEEN BASIC TIMES AND ALLOWANCE TIMES. BASIC TIMES ARE THE TIMES REQUIRED



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TO CARRY OUT INDIVIDUAL TASKS AND ALLOWANCE TIMES COVER THE ACTIVITIES THAT OCCUR IRREGULARLY. WE DO NOT HAVE TIMES FOR SITUATIONS SUCH AS:

1. REPAIRS THAT ARE NOT CARRIED OUT WITH EACH INDIVIDUAL OPERATION.
2. ADDITIONAL JOBS ARISING FROM AN UNFORESEEN OR ABNORMAL CONDITION IN THE SHIPYARD.

OUR SNAME PANEL 8 Task ES-8-L8 (PHASE IV) IS A THREE PHASE PROJECT.


PHASE 1. MAINSAVER - COMPUTERIZED
MAINTENANCE MANAGEMENT

PHASE 2. TRANSFER OF ENGINEERED PERFORMANCE STANDARDS FOR
PUBLIC WORKS MAINTENANCE INTO LABOR STANDARDS
FOR NASSCO'S TRANSPORTATION MAINTENANCE GROUP

PHASE 3. MANUAL PERFORMANCE REPORTING FOR NASSCO'S TRANSPORTATION MAINTENANCE EMPLOYEES

THE MOST IMPORTANT PHASE OF OUR PROJECT PROVIDES FOR A DEMONSTRATION OF THE TRANSFERABILITY OF INDIRECT STANDARD DATA THAT CURRENTLY EXISTED OUTSIDE THE SHIPBUILDING INDUSTRY. WE ARE USING ENGINEERED PERFORMANCE STANDARDS WHICH ARE APPROXIMATELY 4,000 ELEMENTAL TIME STANDARDS DEVELOPED BY ENGINEERING FIELD DIVISION INDUSTRIAL ENGINEERS AND INDUSTRIAL ENGINEERING TECHNICIANS WHICH ARE THE FOUNDATION BLOCKS FOR THE NAVY'S ENGINEERED PERFORMANCE STANDARDS (EPS) FOR PUBLIC WORKS MAINTENANCE. THE MOST CRITICAL FACT THAT WE HAVE LEARNED IS THAT:

HUMAN BEINGS ARE IMPORTANT TO PREVENTATIVE MAINTENANCE
BECAUSE NEARLY ALL MAINTENANCE ACTIVITIES ARE HUMAN ACTIVITIES, ALMOST ENTIRELY CONTROLLED BY THE INDIVIDUALS CARRYING THEM OUT. UNLESS THESE INDIVIDUALS DO THE JOB AND DO THE JOB PROPERLY, EVEN THE MOST PERFECT PROCEDURE WILL NEVER ACHIEVE ANYTHING.

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SAVINGS PER YEAR THAT HAVE BEEN GAINED DUE TO SP-8 PARTICIPATION.

\$ 100,000 FOR FORKLIFT UP TIME GAINED

\$ 40,000 FOR ELIMINATION OF CLERICAL POSITION

\$ 30,000 FOR REDUCTION OF ISD SUPPORT REQUIRED

WE ANTICIPATE SAVINGS WELL OVER \$1,000,000 AS OUR PREVENTIVE MAINTENANCE AND TRANSFERABILITY OF DATA PROJECT CONCLUDES.



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TOOL LIST, MATERIAL HANDLING, WORK STATION,
PARTS, STAFFING

TOOL LIST

1. DRIP PAN
2. SPINDLE WRENCH
3. FUNNEL
4. GALLON OIL CAN
5. HAND TOOLS
6. AIR POWER TOOLS: IMPACT WRENCH (GUN)

MATERIAL HANDLING

1. DRIVE VEHICLE TO AND FROM WORK AREA.
NO CRANES
NO FORK LIFTS

WHERE PM IS DONE

1. MOST DONE IN MAINTENANCE
MAINTENANCE EMPLOYEES PICK UP EQUIPMENT THEMSELVES.

PARTS

1. NO PARTS BECAUSE NO REPAIR IS REQUIRED.

TWO MEN

1. TWO MEN ARE NOW PERFORMING THE WORK.



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FOR **NASSCO'S** TRANSPORTATION MAINTENANCE **GROUP**

METHODS FOR ALL VEHICLES EXCEPT CRANES:

1. BRING VEHICLE TO SHOP.
2. GET MATERIALS READY (OIL, FILTERS, TOOLS) AND TRANSPORT OIL AND KEEP CLOSE TO THE UNIT TO BE SERVICED.
3. DRAIN OLD OIL AS REQUESTED (COULD BE ENGINE OIL, COULD BE HYDRAULIC OIL) .
4. WHILE OIL IS DRAINING, REMOVE ALL FILTERS AS REQUIRED, USUALLY FOUR FILTERS.
5. CHECK CONDITION OF BATTERY FOR WATER AND CHARGE. CHECK ALL. RESERVOIRS, BRAKE AND HYDRAULIC.
6. AFTER OIL IS DRAINED, PUT IN PLUGS.
7. FILL WITH OIL.
8. STEAM CLEAN AND LUBE.
9. DRIVE UNIT BACK TO ORIGINAL LOCATION.



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GUIDELINE FOR TUNE-UP

1. CHECK TORQUE ON ALL HEAD BOLTS USING SPEC' S.
2. ADJUST VALVES,
3. TEST FUEL NOZZLES AND REPLACE IF FAULTY. REPLACE SEALS .
4. CHECK RACK SETTING.
5. INSPECT FUEL PUMP PLUNGER AND LIFTER YOKES FOR WEAR. ADJUST
LIFTER YOKES TO COMPENSATE FOR WEAR IF NECESSARY.
6. PULL AIR/FILTER TO INSPECT TURBOCHARGER.
7. REPLACE VALVE COVER GASKETS IF LEAKAGE OCCURS.

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HAMMERHEAD - GANTRY #1

Monthly: Using check point lists, inspect the following:


- M1. Reel Motors and Travel Motors
 - Reel motor connections
 - a. Feeder cable connections
 - c. Controller connections
 - d. Travel motor connections
 - e. Brake coil connections
 - f. Travel motor bearing oil
 - g. Travel brake connections
- M2. Engine Room
 - Hoist motor brushes and brake assembly
 - a. Swing motor brushes and brake assembly
 - c. Resistor bank connections
 - d. Switchboard connections

Quarterly: Using check point lists, inspect the following:

- Q1. Reel and Travel Motors
 - a. Sliding contacts on cable reel
 - b. Brake adjustments
 - c. Record insulation resistance readings on:
 - 1. Reel motor
 - 2. Travel motors #1 _____ #2 _____
- Q2. Main Collector Rings
 - a. Clean and inspect -
- Q3. Engine Room
 - Switchboard contractors
 - a. Record insulation resistance readings on:
 - 1. Hoist motor: Primary _____ Secondary _____
 - 2. Swing motor: Primary _____ Secondary _____
 - 3. Trolley motor

Semi-Annual: Using check point lists, inspect the following:

- S1. Reel and Travel Motors
 - Open and clean reel motor and controller
 - a. Clean travel motors with air and solvent
- S2. Operator's Console
 - Open and clean controllers
 - b. Adjust contacts
- S3. Engine Room
 - a. Open and clean hoist motor
 - b. Open and clean swing motor
 - c. Open and clean trolley motor
 - d. Clean main board

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Hammerhead - Gantry #1

Annual: Using check point lists, inspect the following:
 Al. Main Circuit Breaker
 a. Test and calibrate circuit breaker



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GANTRY #2

- Monthly: Using check point lists, inspect the following:
- M1. Travel Motors
 - a. Brush rigging connections
 - b. Test emergency stop button - record
 - c. Brakes and coil connections
 - M2. Engine Platform
 - a. Generator connections
 - b. Electric meters
 - c. Replace air filters
 - M3. Engine Room
 - a. Switchboard connections & contactors
 - b. Resistor Banks
 - c. Ensure eddy current rings are in place
 - d. Hoist and swing motor connections
 - M4. Boom Lights
 - a. Check boom lights
 - M5. Slip Ring Platform
 - a. Slip ring connections and wiring
- Quarterly: Using check point lists, inspect the following:
- Q1. Travel motors
 - a. Clean grease and oil from motors
 - b. Brakes
 - c. Take and record insulation reading on travel motors
 - Q2. Engine Room
 - a. Hoist motor brushes and slip rings
 - b. Swing motor brushes and slip rings
 - c. Take and record insulation readings on:
 - 1. Hoist motor
 - 2. Swing motor
 - d. Switchboard connections and wiring
 - Q3. Operator's Console and Main Generator
 - a. Clean controls
 - b. Contacts and wiring
 - c. Take and record insulation readings on main generator
- Semi-Annual: Using check point lists, inspect the following:
- S1. Travel Motors
 - a. Open and clean motors
 - b. Slip rings



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Gantry #2

- S2. Engine Platform
 - a. Pressure switch
 - b. Compressor motor
 - c. Voltage regulator
 - d. Open and clean generator exciter and main windings
- S3. Main Collector Rings
 - a. Clean ring assembly
 - b. Brushes, brush rigging and shoe
 - c. Clean slip ring housing
- S4. Engine Room
 - a. Open and clean:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. Control air compressor motor
 - 4. Control air compressor switch
- S5. Boom
 - a. Check condition of limit switches

Annual:

Using check point lists, inspect the following:
A1. Test and calibrate circuit breaker



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GANTRY #3

Monthly:

Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brush rigging connections
 - b. Test emergency stop button - record
 - c. Brakes and coil connections
- M2. Engine Platform
 - a. Generator connections
 - b. Electric meters
 - c. Replace air filters
- M3. Engine Room
 - a. Switchboard connections & contractors
 - b. Resistor Banks
 - Ensure eddy current rings are in place
 - c. Hoist and swing motor connections
- M4. Boom Lights
 - a. Check boom lights
- M5. Slip Ring Platform
 - a. Slip ring connections and wiring

Quarterly:

Using check point lists, inspect the following:

- Q1. Travel motors
 - a. Clean grease and oil from motors
 - b. Brakes
 - c. Take and record insulation reading on travel motors
- Q2. Engine Room
 - a. Hoist motor brushes and slip rings
 - b. Swing motor brushes and slip rings
 - c. Take-and record insulation readings on:
 - 1. Hoist motor
 - 2. Swing motor
 - d. Switchboard connections and wiring
- Q3. Operator's Console and Main Generator
 - a. Clean controls
 - b. Contacts and wiring
 - c. Take and record insulation readings on main generator

Semi-Annual:

Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Open and clean motors
 - b. Slip rings



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Gantry #3

- S2. Engine Platform
 - a. Pressure switch
 - b. Compressor motor
 - c. Voltage regulator
 - d. Open and clean generator exciter and main windings
- S3. Main Collector Rings
 - a. Clean ring assembly
 - b. Brushes, brush rigging and shoe
 - c. Clean slip ring housing
- S4. Engine Room
 - a. Open and clean:
 - 1. **Hoist motor**
 - 2. Swing motor
 - 3. Control air compressor motor
 - 4. Control air compressor switch
- S5. Boom
 - a. Check condition of limit switches

Annual:

Using check point lists, inspect the following:
A1. Test and calibrate circuit breaker



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GANTRY #4

Monthly : Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brush rigging connections
 - b. Test emergency stop button - record
 - c. Brakes and coil connections
- M2. Engine Platform
 - a. Generator connections
 - b. Electric meters
 - c. Replace air filters
- M3. Engine Room
 - a. Switchboard connections & contractors
 - b. Resistor Banks
 - c. Ensure eddy current rings are in place
 - d. Hoist and swing-motor connections
- M4. Boom Lights
 - a. Check boom lights
- M5. Slip Ring Platform
 - a. Slip ring connections and wiring

Quarterly: Using check point lists, inspect the following:

- Q1. Travel motors
 - a. Clean grease and oil from motors
 - b. Brakes
 - c. Take and record insulation reading on travel motors
- Q2. Engine Room
 - a. Hoist motor brushes and slip rings
 - b. Swing motor brushes and slip rings
 - c. Take and record insulation readings on:
 - 1. Hoist motor
 - 2. Swing motor
 - d. Switchboard connections and wiring
- Q3. Operator's Console and Main Generator
 - a. Clean controls
 - b. Contacts and wiring
 - c. Take and record insulation readings on main generator

Semi-Annual: Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Open and clean motors
 - b. Slip rings

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Gantry #4

- S2 . Engine Platform
 - a. Pressure switch
 - b. Compressor motor
 - c. Voltage regulator
 - d. Open and clean generator exciter and main windings
- S3. Main Collector Rings
 - a. Clean ring assembly
 - b. Brushes, brush rigging and shoe
 - c. Clean slip ring housing
- S4 . Engine Room
 - a. Open and clean:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. Control air compressor motor
 - 4. Control air compressor switch
- S5 . Boom
 - a. Check condition of limit switches

Annual:

Using check point lists, inspect the following:
 A1. Test and calibrate circuit breaker



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GANTRY #5

Monthly: Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brush rigging connections
 - b. Test emergency stop button - record
 - c. Brakes and coil connections
- M2. Engine Platform
 - a. Generator connections
 - b. Electric meters
 - c. Replace air filters
- M3. Engine Room
 - a. Switchboard connections & contractors
 - b. Resistor Banks
 - c. Ensure eddy current rings are in place
 - d. Hoist and swing motor connections
- M4. Boom Lights
 - a. Check boom lights
- M5. Slip Ring Platform
 - a. Slip ring connections and wiring

Quarterly: Using check point lists, inspect the following:

- Q1. Travel motors
 - a. Clean grease and oil from motors
 - b. Brakes
 - c. Take and record insulation reading on travel motors
- Q2. Engine Room
 - a. Hoist motor brushes and slip rings
 - b. Swing motor brushes and slip rings
 - c. Take and record insulation readings on:
 - 1. Hoist motor
 - 2. Swing motor
 - d. Switchboard connections and wiring
- Q3. Operator's Console and Main Generator
 - a. Clean controls
 - b. Contacts and wiring
 - c. Take and record insulation readings on main generator

Semi-Annual: Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Open and clean motors
 - b. Slip rings



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Gantry #5

- S2. Engine Platform
 - a. Pressure switch
 - b. Compressor. motor
 - c. Voltage regulator
 - d. Open and clean generator exciter and main windings
- S3. Main Collector Rings
 - a. Clean ring assembly
 - b. Brushes, brush rigging and shoe
 - c. Clean slip ring housing
- S4. Engine Room
 - a. Open and clean:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. Control air compressor motor
 - 4. Control air compressor switch
- S5. Boom
 - a. Check condition of limit switches

Annual:

Using check point lists, inspect the following:
A1. Test and calibrate circuit breaker



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GANTRY #6

Monthly: Using check point lists, inspect the following travel motors:

- M1.
 - a. Brush rigging connections
 - b. Brakes and coil connections
 - c. Test emergency stop button - record
- M2 . Engine Platform
 - a. Generator connections
 - b. Electrical meters
 - c. Replace generator air filter
- M3 . Slip Ring Platform
 - a. Slip ring connections
 - b. Travel control panel
 - c. Resistor bank connections
- M4 . Engine Room
 - a. Switchboard connections
 - b. Resistor bank connections
 - c. Hoist motor connections
 - d. Swing motor connections
- M5. Boom
 - a. Check boom lights

Quarterly: Using check point lists, inspect the following:

- Q1 . Travel Motors
 - a. Brake assemblies -
 - b. Clean grease and oil from motors
 - c. Take and record insulation readings
- Q2 . Engine Platform
 - Air compressor connections
 - a. Take and record insulation readings on:
 - 1. Generator
 - 2. Compressor motor
- Q3 . Engine Room
 - a. Brushes, brush holders, slip rings on:
 - 1. Hoist motor
 - 2. Swing motor
 - b. Switchboard connections
 - c. Circuit breaker panel connections
 - d. Take and record insulation readings on:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. Compressor motor
- Q4 . Operator's Console
 - a. Control contacts, connections, and wiring
 - b. Weight indicators



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Gantry #6

Semi-Annual: Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Open and clean travel motors
 - b. Open and clean emergency stop buttons
- S2. Engine Platform
 - a. Inspect voltage regulator - clean
 - b. Open and clean generator
 - c. Open and clean compressor motor
 - d. Open and clean pressure switch
- S3. Slip Ring Platform
 - a. Clean slip ring assembly
 - b. Clean slip ring housing
 - c. Clean travel controller
 - d. Clean travel resistor bank
- S4. Engine Room
 - a. Clean hoist and swing panels
 - b. Open and clean:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. Compressor motor
 - 4. Pressure switch
- S5. Operators Console
 - a. Clean all contacts
 - b. Clean control housing

Annual: Using check point lists, inspect the following:

- A1. Main Circuit Breaker
 - a. Test and calibrate circuit breaker



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GANTRY #7

Monthly: Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brush rigging jumpers and brushes
 - b. Test emergency stop buttons - record
- M2. Engine Platform
 - a. Generator connections
 - b. Electrical meters
 - c. Replace generator air filter
- M3. Main Collector Ring
 - a. Slip rings, shoes, springs and wiring
- M4. Engine Room
 - a. Switchboard
 - b. Resistor banks
 - c. TB-750 board and connections - clean
- M5. Main Hoist Motor
 - a. Brushes, slip rings
- M6. Boom Lights
 - a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

- Q1. Travel Motors
 - a. Clean oil and grease from motors
 - b. Brushes, brush rigging and slip rings
 - c. Brake assemblies
 - d. Take and record insulation resistance readings on motors
- Q2. Engine Platform
 - a. Take and record insulation resistance readings on:
 - 1. Generator main windings
 - 2. Compressor motor windings
 - b. Using OHMMETER test and record insulation resistance readings on:
 - 1. Generator exciter windings
- Q3. Engine Room
 - a. Controllers
 - b. Brushes, brush rigging and slip rings on:
 - 1. Hoist motor
 - 2. Swing motor
 - c. Take and record insulation resistance readings on:
 - 1. Swing motor
 - d. With OHMMETER take and record insulation resistance readings on:
 - 1. Hoist motor
 - e. TB-750 controller



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Gantry #7

- Q4 . Operators Cab
 - a Operators console contacts and wiring
 - b. Test weight indicators

Semi-Annual: Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Clean with compressed air
 - b. Slip rings
- S2. Engine Platform
 - a. Clean and inspect:
 - 1. Air compressor motor
 - 2. Pressure switch
- S3 . Main Collector Rings
 - a. Clean rings and housing
 - b. Inspect shoes, springs, and wiring
- S4. Engine Room
 - a. Clean:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. TB-750 controller
 - 4. Air compressor motor and pressure switch
- S5 . Operators Console
 - a. Clean controls and housing
- S6 . Limit Switches
 - a. Condition and operation of switches

Annual: Using check point lists, inspect the following:

- A1. Main Circuit Breaker
 - a. Test and calibrate circuit breaker



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GANTRY #8

Monthly:

Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brush rigging jumpers and brushes
 - b. Test emergency stop buttons - record
- M2. Engine Platform
 - a. Generator connections
 - b. Electrical meters
 - c. Replace generator air filter
- M3. Main Collector Ring
 - a. Slip rings, shoes, springs and wiring
- M4. Engine Room
 - a. Switchboard
 - b. Resistor banks
 - c. TB-750 board and connections - clean
- M5. Main Hoist Motor
 - a. Brushes, slip rings
- M6. Boom Lights
 - a. Repair as necessary

Quarterly:

Using check point lists, inspect the following:

- Q1. Travel Motors
 - a. Clean oil and grease from motors
 - b. Brushes, brush rigging and slip rings
 - c. Brake assemblies
 - d. Take and record insulation resistance readings on motors
- Q2. Engine Platform
 - a. Take and record insulation resistance readings on:
 - 1. Generator main windings
 - 2. Compressor motor windings
 - b. Using OHMMETER test and record insulation resistance readings on:
 - 1. Generator exciter windings
- Q3. Engine Room
 - a. Controllers
 - b. Brushes, brush rigging and slip rings on:
 - 1. Hoist motor
 - 2. Swing motor
 - c. Take and record insulation resistance readings on:
 - 1. Swing motor
 - d. With OHMMETER take and record insulation resistance readings on:
 - 1. Hoist motor
 - e. TB-750 controller

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Gantry #8

- Q4 . Operators Cab
 - a. Operators console contacts and wiring
 - b. Test weight indicators

Semi-Annual: Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Clean with compressed air
 - b. Slip rings
- S2 . Engine Platform
 - a. Clean and inspect:
 - 1. Air compressor motor
 - 2. Pressure switch
- S3. **Main Collector Rings**
 - a. Clean rings and housing
 - b. Inspect shoes, springs, and wiring
- S4 . Engine Room
 - a. Clean:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. TB-750 controller
 - 4. Air compressor motor and pressure switch
- S5. Operators Console
 - a. Clean controls and housing
- S6. Limit Switches
 - a. Condition and operation of switches

Annual: Using check point lists, inspect the following:

- A1. Main Circuit Breaker
 - a. Test and calibrate circuit breaker



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GANTRY #9

Monthly: Using check point lists; inspect the following:

- M1. Travel Motors
 - a. Brush rigging jumpers and brushes
 - b. Test emergency stop buttons - record
- M2. Engine Platform
 - Generator connections
 - a. Electrical meters
 - c. Replace generator air filter
- M3. Main Collector Ring
 - a. Slip rings, shoes, springs and wiring
- M4. Engine Room
 - a. Switchboard
 - b. Resistor banks
 - c. TB-750 board and connections - clean
- M5. Main Hoist Motor
 - a. Brushes, slip rings
- M6. Boom Lights
 - a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

- Q1. Travel Motors
 - a. Clean oil and grease from motors
 - b. Brushes, brush rigging and slip rings
 - c. Brake assemblies
 - d. Take and record insulation resistance readings on motors
- Q2. Engine Platform
 - a. Take and record insulation resistance readings on:
 - 1. Generator main windings
 - 2. Compressor motor windings
 - b. Using OHMMETER test and record insulation resistance readings on:
 - 1. Generator exciter windings
- Q3. Engine Room
 - a. Controllers
 - b. Brushes, brush rigging and slip rings on:
 - 1. Hoist motor
 - 2. Swing motor
 - c. Take and record insulation resistance readings on:
 - 1. Swing motor
 - d. With OHMMETER take and record insulation resistance readings on:
 - 1. Hoist motor
 - e. TB-750 controller

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Gantry #9

- Q4 . Operators Cab
 - a. Operators console contacts and wiring
 - b. Test weight indicators

Semi-Annual: Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Clean with compressed air
 - b . Slip rings
- S2 . Engine Platform
 - a. Clean and inspect:
 - 1. Air compressor motor
 - 2. Pressure switch
- S3. Main Collector Rings
 - a. Clean rings and housing
 - b. Inspect shoes, springs, and wiring
- S4 . Engine Room
 - a. Clean:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. TB-750 controller
 - 4. Air compressor motor and pressure switch
- S5. Operators Console
 - a. Clean controls and housing
- S6. Limit Switches
 - a. Condition and operation of switches

Annual:

- Using check point lists, inspect the following:
- Al. Main Circuit Breaker
 - a. Test and calibrate circuit breaker



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GANTRY #10

Monthly: Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brushes and connections
 - b. Brake assemblies
- M2. Engine Platform
 - a. Generator connections
 - b. Circuit breaker connections
 - c. Electric meters
 - d. Replace
- M3. Main Collector Rings
 - a. Connections and wiring
- M4. Engine Room
 - a. Switchboard
 - b. Resistor banks
 - c. M.G. set starter panel
- M5. Boom Lights
 - a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

- Q1. Travel Motors
 - a. Clean brake assemblies and adjust
 - b. Take and record insulation resistance readings on primaries and secondaries
- Q2. Engine Platform
 - a. Take and record insulation resistance on:
 - 1. Air compressor motor
 - 2. Generator main windings
 - 3. Use OHMMETER to read exciter from regulator leads
- Q3. Engine Room
 - a. Controllers
 - b. Main switchboard
 - c. M.G. starter panel
- Q4. Main Motors, M.G. Sets
 - a. Brushes, brush rigging springs on:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. Boom motor
 - 4. M.G. set hoist
 - 5. M.G. set swing
- Q5. Main Motors, M.G. Sets and Blowers
 - a. Using OHMMETER take and record insulation resistance on:
 - 1. Hoist motor stator _____ rotor _____
 - 2. Swing motor stator _____ rotor _____



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Gantry #10

- 3. Loom motor stator _____ rotor _____
- 4. M.G. hoist generator field _____ armature _____
- 5. M.G. swing generator field _____ armature _____
- Q6. M.G. Motors and Blowers
 - a. Using meggar take and record insulation resistance on:
 - 1. Hoist M.G. motor
 - 2. Swing M.G. motor
 - 3. M.G. blower motor
 - 4. Swing motor blower motor
 - 5. Hoist motor blower motor
 - 6. Boom motor blower motor
- Q7. Operator's Console
 - a. Contacts and wiring
 - b. Test weight indicator

- Semi-Annual: Using check point lists, inspect the following:
- S1. Travel Motors
 - a. Clean motors with air and solvent
 - S2. Engine Platform
 - a. Clean and inspect air compressor motor and pressure switch.
 - b. Voltage regulator wiring
 - c. Clean generator windings with air
 - d. Read generator's voltage
 - S3. Main Collector Rings :
 - a. Clean housing
 - b. Inspect brushes, shoes, springs and wiring
 - S4. Engine Room
 - a. Clean all motors and generators
 - b. Clean and inspect pressure switch for control air compressor
 - c. Clean main circuit breaker and panel housing
 - S5. Limit Switches
 - a. Check condition and operation of limit switches

- Annual: Using check point lists, inspect the following:
- A1. Circuit Breakers and Overloads
 - a. Test circuit breakers and overloads for proper trip settings



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GANTRY #11

Monthly: Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brushes and connections
 - b. Brake assemblies
- M2. Engine Platform
 - a. Generator connections
 - b. Circuit breaker connections
 - c. Electric meters
 - d. Replace
- M3. Main Collector Rings
 - a. Connections and wiring
- M4. Engine Room
 - a. Switchboard
 - b. Resistor banks
 - c. M.G. set starter panel
- M5. Boom Lights
 - a. Repair as necessary

Quarterly: Using check point lists, inspect the following:

- Q1. Travel Motors
 - a. Clean brake assemblies and adjust
 - b. Take and record insulation resistance readings on primaries and secondaries
- Q2. Engine Platform
 - a. Take and record insulation resistance on:
 - 1. Air compressor motor
 - 2. Generator main windings
 - 3. Use OHMMETER to read exciter from regulator leads
- Q3. Engine Room
 - a. Controllers
 - b. Main switchboard
 - c. M.G. starter panel
- Q4. Main Motors, M.G. Sets
 - a. Brushes, brush rigging springs on:
 - 1. Hoist motor
 - 2. Swing motor
 - 3. Boom motor
 - 4. M.G. set hoist
 - 5. M.G. set swing
- Q5. Main Motors, M.G. Sets and Blowers
 - a. Using OHMMETER take and record insulation resistance on:
 - 1. Hoist motor stator _____ rotor _____
 - 2. Swing motor stator _____ rotor _____



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Gantry #11

- 3. Boom motor stator _____ rotor _____
- 4. M.G. hoist generator field _____ armature _____
- 5. M.G. swing generator field _____ armature _____
- Q6 . M.G. Motors and Blowers
 - a. Using meggar take and record insulation resistance on:
 - 1. Hoist M.G. motor
 - 2. Swing M.G. motor
 - 3. M.G. blower motor
 - 4. Swing motor blower motor
 - 5. Hoist motor blower motor
 - 6. Boom motor blower motor
- Q7 . Operator's Console
 - a. Contacts and wiring
 - b. Test weight indicator

Semi-Annual: Using check point lists, inspect the following:

- S1 . Travel Motors
 - a. Clean motors with air and solvent
- S2 . Engine Platform
 - a. Clean and inspect air compressor motor and pressure switch
 - b. Voltage regulator wiring
 - c. Clean-generator windings with air
 - d. Read generator's voltage
- S3 . Main Collector Rings
 - a. Clean housing
 - b. Inspect brushes, shoes, springs and wiring
- S4 . Engine Room
 - a. Clean all motors and generators
 - b. Clean and inspect pressure switch for control air compressor
 - c. Clean main circuit breaker and panel housing
- S5 . Limit Switches
 - a. Check condition and operation of limit switches

Annual: Using check point lists, inspect the following:

- A1. Circuit Breakers and Overloads
 - a. Test circuit breakers and overloads for proper trip settings



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GANTRY #12

Monthly:

Using check point lists, inspect the following:

- M1. Travel Motors
 - a. Brushes and brush rigging connections
 - b. Balance resistor connections
 - c. Motor connections
- M2. Engine Platform
 - a. Generator connections
 - b. Replace generator air filter
- M3. Main Collector Rings
 - a. Wiring and connections
- M4. Engine Room
 - a. Switchboard wiring and connections
 - b. Insure blower motors are operating and check air ducts to hoist and boom hoist motors
- M5. Operator's Console
 - a. Connections and wiring
- M6. Boom Lights
 - a. Repair as necessary

Quarterly:

Using check point lists, inspect the following:

- Q1. Travel Motors
 - a. Using MEGGAR record ROTOR insulation resistance
 - b. Using OHMMETER record FIELD insulation resistance
 - c. Brake assemblies
- Q2. Travel Generators and Swing Generators
 - a. Using MEGGAR record insulation resistance on:
 - 1. Air compressor motor
 - 2. Travel generator armature _____
 - 3. Swing generator armature _____
 - 4. Exciter armature
 - b. Using OHMMETER record insulation resistance on:
 - 1. Travel field
 - 2. Swing field
 - 3. Exciter field
 - c. Inspect brushes, commutator, brush rigging on:
 - 1. Swing generator
 - 2. Travel generator
 - 3. Exciter generator
- Q3. Main Hoist and Boom Hoist
 - a. Using OHMMETER record insulation resistance on:
 - 1. Main hoist generator armature _____
 - 2. Main hoist generator field _____
 - 3. Boom hoist generator armature _____
 - 4. Boom hoist generator field _____



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- b. Inspect brushes, brush rigging and commutator on:
 - 1. Main hoist generator
 - 2. Boom hoist generator
 - 3. Exciter generator
- c. Using OHMMETER record insulation resistance on:
 - 1. Swing motor field _____ NOTE #1
 - 2. Main hoist field _____
 - 3. Boom hoist field _____
- Q4. Engine Room Controllers
 - a. Inspect contacts, springs wiring
- Q5. Operator's Cab
 - a. Controller
 - b. Weight Indicator

Semi-Annual: Using check point lists, inspect the following:

- S1. Travel Motors
 - a. Clean motors with air
 - b. Clean balance resistors
- S2. Engine Platform
 - a. Clean compressor motor and pressure switch
 - b. Voltage regulator
 - c. Clean generators
 - d. Clean travel overload panel
- S3. Engine Room
 - a. Clean motors and M.G. sets
 - b. Clean switchboard and panels
 - c. Clean resistor banks
 - d. Clean main circuit breaker and housing
- S4. Main Collector Rings
 - a. Clean rings, shoes
 - b. Clean housing
- S5. Top of House
 - a. Clean and tighten connections on dynamic lowering resistors

Annual: Using check point lists, inspect the following:

- A1. Circuit Breakers
 - a. Test circuit breakers for proper trip settings



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D 353 CYLINDER HEAD TORQUE SEQUENCE

1. TIGHTEN ALL NUTS BY NUMBER TO 180 ± 10 FT. LB.
 2. TIGHTEN ALL NUTS BY NUMBER TO 300 ± 10 FT. LB.
 3. TIGHTEN ALL NUTS BY NUMBER TO 300 ± 10 FT. LB.
-
1. INTAKE VALVE = .018 IN.
EXHAUST VALVE = .030 IN.
 - 2.
 - TORQUE FOR FUEL PUMP BOLTS 32 ± 5 FT. LB.
 3. TIMING DIMENSION FOR THE FUEL INJECTION PUMPS:
ON ENGINE (PISTON AT TOP CENTER) $2.090 \pm .002$ IN.
 4. TORQUE FOR NUT THAT HOLDS NOZZLES 105 ± 5 FT. LB.



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ENGINE SPECIFICATIONS

Number of cylinders:

D379 and G379 8
D398 and G398 12

Bore and stroke 6 $\frac{1}{4}$ " x 8"

Firing order:

D379
Counterclockwise 1-8-5-4-7-2-3-6
Clockwise 1-4-5-2-7-6-3-8

D398

Counterclockwise 1-12-9-5-8-11-2-3-10-7-6
Clockwise 1-4-9-8-5-2-11-10-3-6-7-12

Balancer Gears (D379 and G379 Only)

Shaft diameter 1.5996 - 1.6000 in.
Bearing bore 1.6019 - 1.6025 in.
Bearing clearance0019 - .0029 in.
Permissible bearing clearance006 in.
End clearance0060 - .0135 in.
Permissible end clearance019 in.

Camshaft

Bearing journal diameter . 2.9660 - 2.9670 in.
Bearing clearance002 - .006 in.
Permissible bearing clearance009 in.
End clearance006 - .010 in.
Permissible end clearance020 in.
Gear retaining bolts, torque . 60 - 70 lb. ft.
Backlash between camshaft gear
and crankshaft gear003 - .005 in.

Connecting Rod

Conn. rod bearing clearance .0043 - .0072 in.
Permissible bearing clearance012 in.
Center-to-center distance 17.990 - 18.0010 in.
Bore in piston pin bearing 2.4510 - 2.4516 in.
Conn. rod bolt nuts, torque 250 lb. ft.
Conn. rod bolt torque (when
equipped with serrated conn. rod)
Lubricate and tighten to 40 \pm 4 lb. ft.
plus additional 120 \pm 5°
Side end clearance012 - .021 in.

Cylinder Head

Tighten nuts in sequence shown
in illustration

Initial 150 lb.
2nd 250 lb.
3rd 250 lb.

CYLINDER HEAD STUD NUT TIGHTENING SEQUENCE

Cylinder Liner (Use 6H4141 Adapter
Plate for Removal)

Inside diameter 6.250 - 6.252 in.
Permissible liner wear (increase in
diameter at top of ring travel) . . .020 in.
Counterbore dimension in block .498 - .500 in.
Liner flange thickness504- .506 in.

Flywheel

Run-out:

Permissible at outside diameter .006 in.
Permissible at face006 in.
Retaining bolts, torque . . . 345 - 405 lb. ft.

Flywheel Housing

Retaining bolts, torque

Inside housing 118 - 142 lb. ft.
All others 60 - 70 lb. ft.

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WM

Date JANUARY, 19

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ENGINE SPECIFICATIONS (CONTINUED)

Crankshaft

Main journal diameter 5.790 - 5.7500 in.
Permissible bearing clearance015 in.
End clearance08- .021 in.
Permissible end clearance035 in.

Main bearing stud nut torque
(earlier) 75 - 825 lb. ft.
(Later) 66 B891-up, 67 B313-up, 68 B763-up,
69B321-up, 72B133-up, 73B155-up,
75B141-up and 76B88-up 200 lb. ft.
plus additional 1/3 turn.

Connecting rod journal
diameter 4.9990 - 5.0000 in.
Permissible journal wear010 in.
Permissible out-of-roundness (journal).006 in.

Cylinder Block

Main bearing original bore
dimension 6.3720 - 6.3730 in.

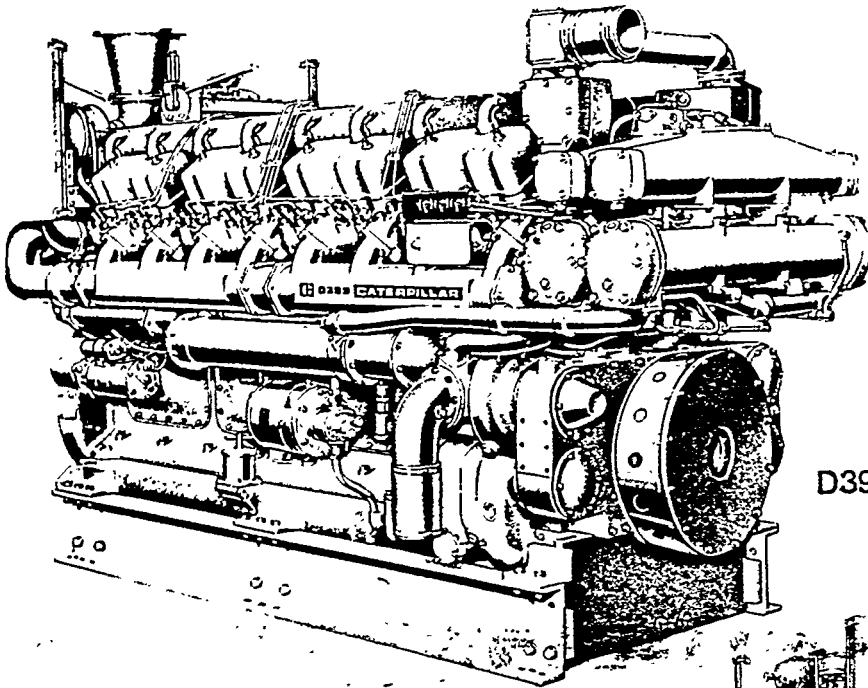
Front Accessory Drive

Main idler shaft diam. . .	2.9960 - 2.9970	ir
Main idler bearing bore . . .	3.000 - 3.001	ir
Main idler bearing clearance	.0035 - .0055	ir
Permissible bearing clearance010	ir
Small idler gear shaft diameter		
(two)	1.9975 - 1.9985	ir
Small idler gear bearing bore		
(two)	2.00-2.001	ir
Sm. idler bearing clear.(two)	.0015 - .0035	ir
Permissible bearing clearance008	ir

Fuel Injection Equipment

Fuel injection pump timing (before top center)	12
Fuel injection pump lifter setting (on engine with piston at top dead center)	2.0860 - 2.0940 in

6.25" Bore Industrial Diesel and Natural Gas Engines

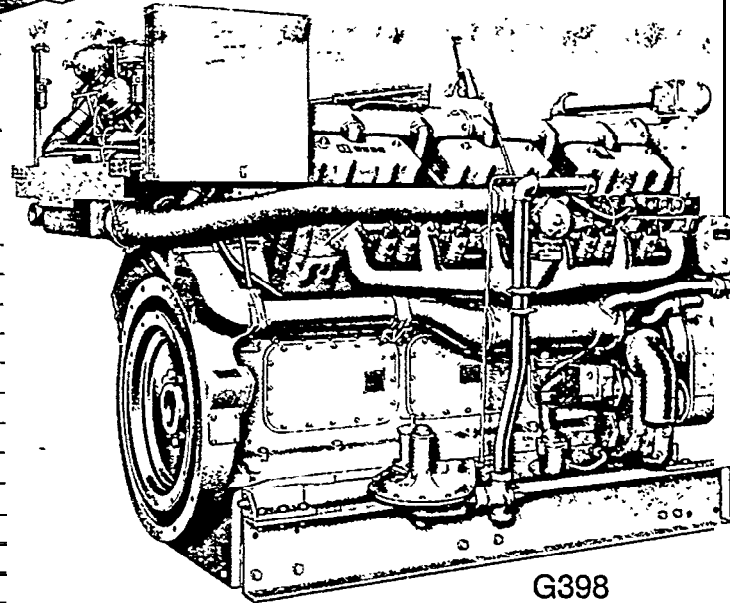


D399

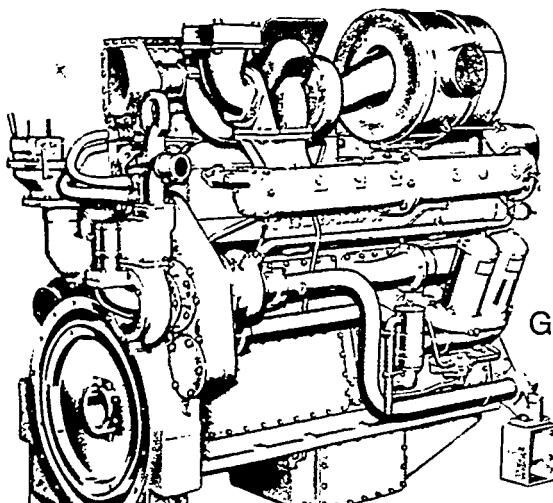
BRIEF SPECIFICATIONS... TURBOCHARGED AND AFTERCOOLED 6.25 IN. X 8 IN. INDUSTRIAL ENGINES

Diesel and Gas Model	No. of Cyl.	Horsepower • Intermittent • Continuous	RPM	Maximum Torque @ RPM	Displacement • Cubic In. • Liters	Weight • lbs. • kg.	Length • in. • mm.	Width • in. • mm.	Height • in. • mm.
D399	V16	1300	1300	—	3928	15,000	118	60	79
		1000	1200	4600 @ 960	64.5	6804	3007	1516	2002
D398B	V12	975	1300	—	2946	11,800	89	56	79
		750	1200	3510 @ 900	48.3	5350	2250	1425	2002
D379B	V8	650	1300	—	1964	9,000	67	56	75
		500	1200	2200 @ 1110	32.2	4080	1690	1425	1905
D353E	6	490	1300	—	1473	6,180	75	43	66
		375	1200	1700 @ 980	24.1	2803	1895	1100	1665
G399	V16	—	—	—	3928	15,400	118	66	79
		930	1200	4400 @ 940	64.5	6970	3007	1675	2002
G398A	V12	—	—	—	2946	12,500	89	61	73
		700	1200	3360 @ 750	48.3	5670	2250	1547	1849
G379A	V8	—	—	—	1964	9,200	67	62	73
		465	1200	2120 @ 900	32.2	4170	1692	1565	1849
G353D	6	—	—	—	1473	6,350	76	44	66
		350	1200	1680 @ 750	24.1	2880	1920	1105	1665

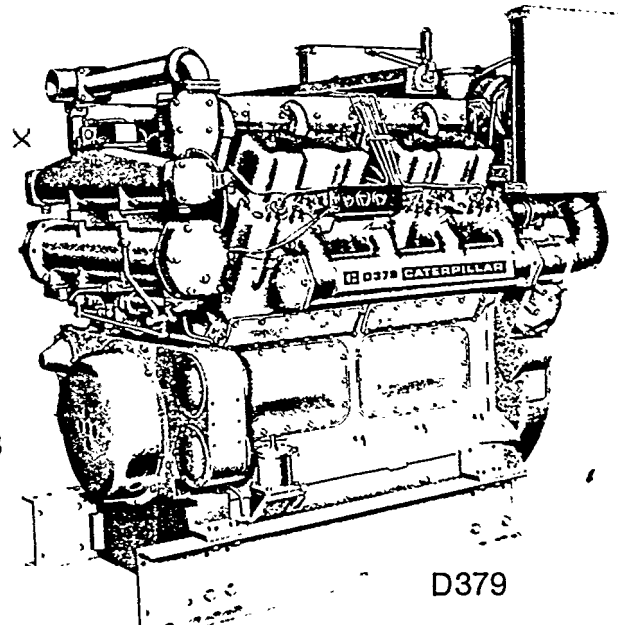
Ratings are without fan. All natural gas model outputs are for operation with 10:1 compression ratio and with 90° (32°C) water to aftercooler. See pages 22 and 23 for other ratings.



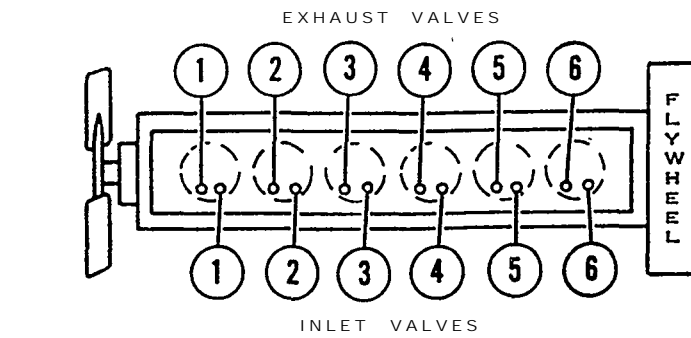
G398



G353



D379



D353 ENGINES

8. With NO. 1 CYLINDER ON COMPRESSION STROKE, check the lash of the following valves; adjust if necessary.

NO. 1 CYLINDER ON COMPRESSION STROKE

VALVES	CYLINDERS	VALVE LASH (Inches)		
		D342	D343	D353
Exhaust	1-3-5	.020	.030	.030
Inlet	1-2-4	.016	.018	.018
.020 Inch = 0,51 mm. .030 Inch = 0,76 mm.				
.016 Inch = 0,41 mm. .018 Inch = 0,46 mm.				

9. With NO. 1 CYLINDER ON EXHAUST STROKE check the lash of the following valves; adjust if necessary.

NO. 1. CYLINDER ON EXHAUST STROKE

VALVES	CYLINDERS	VALVE LASH (Inches)		
		D342	D343	D353
Exhaust	2-4-6	.020	.030	.030
Inlet	3-5-6	.016	.018	.018
.020 inch = 0,51 mm. .030 inch = 0,76 mm.				
.016 inch = 0,41 mm. .018 inch = 0,46 mm.				

10. Bar the flywheel one revolution in the direction of normal rotation and align the flywheel "TC 1" timing mark with the timing pointer.
11. Set the remaining valves as specified in the remaining chart.

Every 2000 Service Hours

PAGE: 6 -

When on compression stroke both inlet and exhaust valve rockers can be easily moved with finger pressure.

7. Check the No. 1 cylinder rockers for movement. Determine if the piston is on COMPRESSION or HAUST STROKE.

When on exhaust stroke only the inlet valve rockers can be moved freely with finger pressure.

Valve Setting Chart				
Valve Lash Clearance Adjustment - No. 1 Cylinder on Compression Stroke:				
Engine Rotation:	Exhaust Valves		Inlet Valves	
	Counterclockwise	Clockwise	Counterclockwise	Clockwise
D379	1-4-5-8	1-4-5-8	1-2-3-6	1-3-6-8
D398	1-4-5-6-9-12	1-4-5-8-9-12	1-3-6-7-10-12	1-3-4-6-7-12
D399	1-2-3-4-5-6-8-9	1-2-3-4-5-6-9-10	1-2-7-8-11-12-13-14	1-2-6-7-8-11-13-14

Valve Setting Chart				
Valve Lash Clearance Adjustment - No. 1 Cylinder on Exhaust Stroke:				
Engine Rotation:	Exhaust Valves		Inlet Valves	
	Counterclockwise	Clockwise	Counterclockwise	Clockwise
D379	2-3-6-7	2-3-6-7	4-5-7-8	2-4-5-7
D398	2-3-7-8-10-11	2-3-6-7-10-11	2-4-5-8-9-11	2-5-8-9-10-11
D399	7-10-11-12-13-14-15-16	7-8-11-12-13-14-15-16	3-4-5-6-9-10-15-16	3-4-5-9-10-12-15-16

8. Refer to the preceding table, and set only those valves specified in the appropriate table for No. 1 cylinder on compression stroke or exhaust stroke as determined in step 7.

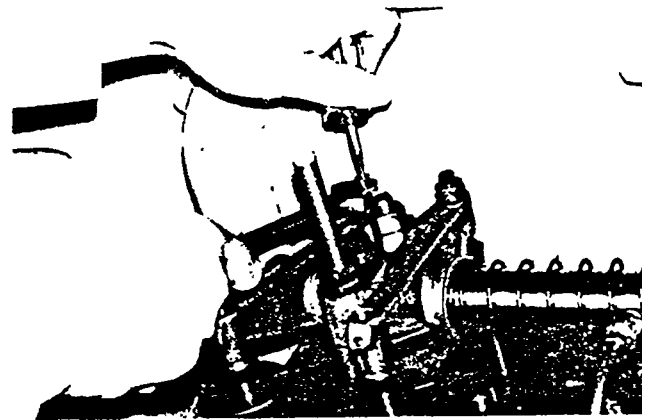
10. Inspect the movement of the rockers for cylinder No. 2.

11. Set the remaining valves as specified in the table.

9. Rotate the flywheel one revolution in the direction of normal rotation and align the flywheel "TC-1" timing mark.

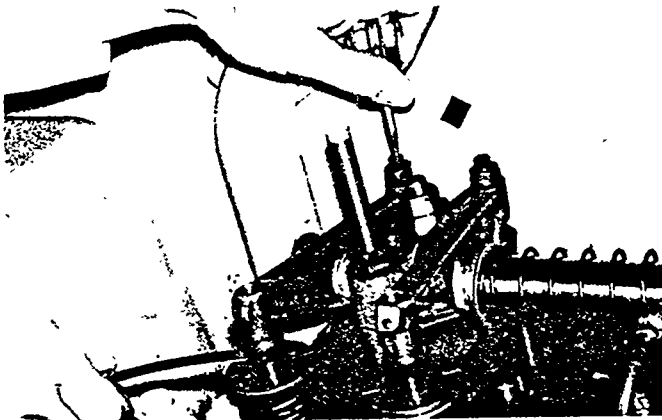
Adjusting Valve Lash

Valve Lash	
Inlet	.015 inch (0.38 mm)
Exhaust	.035 inch (0.89 mm)



When adjusting valve lash, engine must be stopped and cold.

1. Loosen the locknut on the adjusting screw.



3. Hold the adjusting screw and tighten the locknut.

4. Recheck the valve lash.

2. Turn the adjusting screw to obtain the proper valve lash.

②⑧ Engine Valve Rotators

After checking all valve clearances, and before installing the valve cover:

1. Start the engine.

2. Move the governor control to the low idle position.

3. Watch the serrations on each valve retainer. Each valve retainer should turn slightly each time the valve closes.



WM-MANUAL

ALLOWANCE TIMES

Code

WM

Date JANUARY, 1985

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Page 7 - 1

CM 60 #1

WORK ORDER #8512-326 EQUIPMENT #10868

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS



WM-MANUAL

ALLOWANCE TIMES

Code

WM

Date JANUARY, 19

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CM 60 #2

WORK ORDER #8512-327 EQUIPMENT #10869

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS



WM-MANUAL

ALLOWANCE TIMES

Code

WM

Date JANUARY, 1985

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CM 56

WORK ORDER #8512-325 EQUIPMENT #10101

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	2 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	8 HOURS

nasco

WM-MANUAL

ALLOWANCE TIMES

Code

WM

Date JANUARY, 1985

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CM 150

WORK ORDER #8512-330 EQUIPMENT #538

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS



WM-MANUAL

ALLOWANCE TIMES

Code

WM

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CM 70

WORK ORDER #8512-328 EQUIPMENT #536

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS

nasco

WM-MANUAL

ALLOWANCE TIMES

Code

WM

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CM 160

WORK ORDER #8512-332 EQUIPMENT #541

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	24 HOURS



WM-MANUAL

ALLOWANCE TIMES

Code

WM

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CM 100

WORK ORDER #8512-329 EQUIPMENT #537

WEEKLY W-1	LABOR	4 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS

nasco

WM-MANUAL

ALLOWANCE TIMES

Code

WM

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FLAME PLANER

WORK ORDER #8512-331 EQUIPMENT #10875

WEEKLY W-1	LABOR	2 HOURS
BI-WEEKLY BI-W1	LABOR	8 HOURS
QUARTERLY Q-1	LABOR	8 HOURS
ANNUAL A-1	LABOR	16 HOURS



WM-MANUAL

ALLOWANCE TIMES

Code

WM

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WHITNEY PLASMAL PUNCH

WORK ORDER #8511-417 EQUIPMENT #738

BI-WEEKLY BI-W1	LABOR	8 HOURS
MONTHLY M-1	LABOR	16 HOURS
QUARTERLY Q-1	LABOR	16 HOURS
ANNUAL A-1	LABOR	16 HOURS

nosco

WM-MANUAL

ALLOWANCE TIMES

Code

WM

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Page 7 - 10

CLEERMAN DRILL

WORK ORDER #8511-404 EQUIPMENT #751

MONTHLY M-1	LABOR	8 HOURS
QUARTERLY Q-1	LABOR	4 HOURS
SEMI-ANNUAL SA-1	LABOR	16 HOURS

masco

WM-MANUAL

ALLOWANCE TIMES

Code

WM

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Page 7 - 11

CINN. BRAKE PRESS

WORK ORDER #8511-406 EQUIPMENT #705

QUARTERLY Q-1

LABOR

4 HOURS

nosco

WM-MANUAL

ALLOWANCE TIMES

Code

WM

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Page 7 - 12

SHEET METAL MOLD LOFT

WORK ORDER #8511-080	DISC DRIVE # 1 & #2	EQUIPMENT #1420
WORK ORDER #8511-081	TAPE READER/PUNCH 1 & 2	EQUIPMENT #1421
WORK ORDER #8511-082	LINE PRINTER 1 & 2	EQUIPMENT #1422
WORK ORDER #8511-083	CRT TERMINAL 1 & 2	EQUIPMENT #1423

MONTHLY M-1

LABOR

8 HOURS

SEMI-ANNUAL SA-1

LABOR

16 HOURS

nasco

WM-MANUAL

ALLOWANCE TIMES

Code

WM

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MOLD LOFT

WORK ORDER #8573-288	COMPUTER	EQUIPMENT #1402
WORK ORDER #8573-289	INTER POLAR	EQUIPMENT #1403
WORK ORDER #8573-290	TELETYPE #1	EQUIPMENT #1404
WORK ORDER #8573-291	TELETYPE #2	EQUIPMENT #1405
WORK ORDER #8573-292	TAPE PUNCH FACIT	EQUIPMENT #1406
WORK ORDER #8573-293	DRAFTING TABLE	EQUIPMENT #1407
WORK ORDER #8573-294	TAPE PUNCH REMEX	EQUIPMENT #1408
WORK ORDER #8573-295	TAPE PUNCH/READER REMEX	EQUIPMENT #1409

MONTHLY M-1	LABOR	16 HOURS
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SEMI - ANNUAL SA-1	LABOR	16 HOURS
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ANNUAL A-1	LABOR	8 HOURS
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ANNUAL A-2	LABOR	8 HOURS
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ANNUAL A-3	LABOR	16 HOURS
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ANNUAL A-4	LABOR	8 HOURS
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masco

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ALLOWANCE TIMES

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ROLLS MACHINE

WORK ORDER #8512-397 EQUIPMENT #542

MONTHLY M - 1

LABOR

6 HOURS



WM-MANUAL

ALLOWANCE TIMES

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PANEL LINE

WORK ORDER #8512-315	PANEL LINE	EQUIPMENT #534
WORK ORDER #8512-316	ESAB HEBE	EQUIPMENT #530
WORK ORDER #8512-317	STA 1 HYDRAULIC SYSTEM	EQUIPMENT #531
WORK ORDER #8512-318	STA 2 HYDRAULIC SYSTEM	EQUIPMENT #532

MONTHLY M - 1	L A B O R	8 HOURS
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SEMI-ANNUAL SA-1	L A B O R	8 HOURS
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SEMI-ANNUAL SA-112	LABOR	8 HOURS
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SEMI-ANNUAL SA-113	LABOR	8 HOURS
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WM-MANUAL

ALLOWANCE TIMES

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WM

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WHEELABRATOR

WORK ORDER #8512-378	WHEELABRATOR	EQUIPMENT #558
WORK ORDER #8512-379	PAINT BOOTH	EQUIPMENT #1103
WORK ORDER #8512-380	BRUSH OFF SYSTEM	EQUIPMENT #556
WORK ORDER #8512-381	BAG HOUSE	EQUIPMENT #555

MONTHLY M - 1

LABOR

24 HOURS



WM-MANUAL

ALLOWANCE TIMES	
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Date JANUARY, 198

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WORK ORDER #8504-365 EQUIPMENT #394

2 HOURS



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ALLOWANCE TIMES

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SECTION 1

WORK ORDER #8512-304 TRANSFER CART T-1
WORK ORDER #8512-378 R1, R2, R3, R4 & R5

EQUIPMENT #854
EQUIPMENT #558

MONTHLY M-1

LABOR

8 HOURS

ANNUAL A-1

LABOR

24 HOURS



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SECTION 2

WORK ORDER #8512-305	TRANSFER CART T-2	EQUIPMENT #855
WORK ORDER #8512-325	R20	EQUIPMENT #10101
WORK ORDER #8512-307	R22	EQUIPMENT #857
WORK ORDER #8512-311	T2 GATE	EQUIPMENT #861

MONTHLY M-1

8 HOURS

ANNUAL A-1

24 HOURS



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SECTION 3

WORK ORDER #8512-300 COLLOCATOR C-1

EQUIPMENT #850

MONTHLY M-1

LABOR

8 HOURS

ANNUAL A-1

LABOR

24 HOURS



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SECTION 4

WORK ORDER #8512-308 R - L 3

EQUIPMENT #858

WORK ORDER #8512-309 R - 1 4 , R - 1 5

EQUIPMENT #859

WORK ORDER #8512-331 BT 7

EQUIPMENT #10875

WORK ORDER #8512-325 R 2 1

EQUIPMENT #10101

MONTHLY M-1

LABOR

8 HOURS

ANNUAL A-1

L A B O R

8 HOURS



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SECTION 5

WORK ORDER #8512-313 R16A

EQUIPMENT #871

WORK ORDER #8512-310 R16

EQUIPMENT #860

WORK ORDER #8512-314 R17

EQUIPMENT #872

MONTHLY M-1

LABOR

8 HOURS

ANNUAL A-1

LABOR



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SECTION 6

WORK ORDER #8512-331 R19

EQUIPMENT #10875

WORK ORDER #8512-306 T-3

EQUIPMENT #856

WORK ORDER #8611-311 T-3 GATE

EQUIPMENT #861

MONTHLY M-1

LABOR

8 HOURS

ANNUAL A-1

LABOR

24 HOURS

nasco

WM-MANUAL

ALLOWANCE TIMES

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CONVEYOR SYSTEM

WORK ORDER #8512-307 CONTROL TOWER

EQUIPMENT #857

QUARTERLY Q-1

LABOR

8 HOURS



WM-MANUAL

ALLOWANCE TIMES

Code			
WM			
Date JANUARY, 1985			
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SECTION 7

WORK ORDER #8512-327 R6, R7, R8; BT1

EQUIPMENT #10869

WORK ORDER #8512-326 BT2

EQUIPMENT #10868

MONTHLY M-1

LABOR

8 HOURS

ANNAUL A-1

LABOR

24 HOURS



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SECTIONS 8, 9 & 10

WORK ORDER #8512-302 DR1

EQUIPMENT #852

WORK ORDER #8512-303 DR2

EQUIPMENT #853

WORK ORDER #8512-312 C2 GATES

EQUIPMENT #862

WORK ORDER #8512-301 C 2

EQUIPMENT #851

MONTHLY M-1

LABOR

8 HOURS

ANNUAL A-1

LABOR

32 HOURS



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GILBERT BORING MILL

WORK ORDER #8503-533 EQUIPMENT #1533

QUARTERLY Q-1

LABOR

8 HOURS

MONTHLY M-1

LABOR

16 HOURS

nassco

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ALLOWANCE TIMES

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WARNER 8 SWASSEY LATHE

WORK ORDER #8503-580 EQUIPMENT #580

QUARTERLY Q-1

LABOR

8 HOURS

SEMI-ANNUAL SA-1

L A B O R

16 HOURS



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WM

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Page 7 - 29

VERTICAL MACHINING CENTER

WORK ORDER #8503-588 EQUIPMENT #1588

MONTHLY M - 1

LABOR

8 HOURS

SEMI-ANNUAL SA-1

LABOR

16 HOURS

WM-MANUAL

Code

WM

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ALLOWANCE TIMES

MACHINE SHOP MOLD LOFT

WORK	ORDER	#8503-090	DIGITAL PLOTTER	EQUIPMENT	#1427
WORK	ORDER	#8503-091	TAPE PUNCH	EQUIPMENT	#1428
WORK	ORDER	#8503-092	LINE PRINTER	EQUIPMENT	#1429
WORK	ORDER	#8503-093	MICRO COMPUTER	EQUIPMENT	#1430

MONTHLY M - 1 LABOR 8 HOURS

SEMI - ANNUAL LABOR 16 HOURS

EQUIPMENT NO. _____

TYPE VEHICLE _____

DEPT. _____

ROLLING EQUIPMENT

CHECK LIST

NASSCO**SPECIAL REQUESTS**

MODEL NUMBER _____

SERIAL NUMBER _____

DATE INSTALLED _____

DATE SERVICE STARTED _____

SERVICE RECORD
GROUP 1 - 40-50 OPERATING HOURSMONTH
DAY

1. Clean Zerk Fittings and Lubricate
2. Change Engine Oil
3. Check Engine Oil
4. Change Oil Filter Element
5. Clean Air Cleaner — Add Oil
6. Grease Inner Slides
7. Check Battery — Add Water
8. Clean Hydraulic Sump Cap
9. Check Hydraulic Oil Level
10. Drain & Fill Hydraulic Tank (Once a Year)
11. Check Drive Axle and Transmission Lubricant
12. Drain & Fill Transmission
13. Oil — All Connecting Shafts and Levers
14. Replace Fuel Strainer
15. Check for Leaks — Gasoline — Oil — Water
16. Steam Out Radiator Core
17. Check Brakes — Master Cylinder
18. Check and Clean Engine Vent Pipe
19. Check Fan and Generator Belts
20. Check Differential and Transmission Vent
21. Lubricate Lift Chains with S.A.E. 10 — Brush Applied

MECHANIC (Initials)

ENGINE HOUR METER READING

NATIONAL STEEL AND SHIPBUILDING COMPANY
HARBOR DRIVE & 28TH ST.
SAN DIEGO, CALIF. 92138

ENGINEERED PERFORMANCE STANDARDS

Visual inspect part small	390.0 TMU
Visual inspect part medium	464.4 TMU
Visual inspect part large	1061.1 TMU
1058 Pour or drain oil per gallon from crank cases, gear boxes	.0079 Hours
1059 Prepare to wipe oil or grease on large part	1918.2 TMU
1060 Remove approx. 1 quar of 2130 oil from crank case of machine with 3/8 pint capacity hand suction gun	.0250 Hours
1097 Obtain Fork Truck and move to receive part	1502.7 TMU
1165 Apply grease to small part	176.2 TMU
1644 S w e e p	
1645 S w e e p	
1647 Pick up sweepings	
1656 Waste dispose of	
2058 Equipment adjustments or minor repairs	.0952 Hours
2147 Fill tank per gallon	.0027 Hours
2388 Turn switch on or off	128.8 TMU
2392 Start generator	426.3 TMU
2400 Open or close oil valve	72.5 TMU
2402 Turn coolant on and off	186.4 TMU
2572 Remove and lay aside parts per piece	
2594 Read dimension from blueprint	575.5 TMU
2601 Inspect work	.0084 Hours
2605 Check motor bearings for noise while operating	953.5 TMU
2606 Check motor bearing for temperature while operating	71.4 TMU
2610 Inspect, feel with fingers	59.2 TMU
2627 Fork lift, move 20 feet	.0029 Hours
2628 Fork lift, raise and lower 10 feet	.0115 Hours
2759 Hand carry motor components approv. 15 feet from work-bench to cleaning booth hydraulic press or test panels	.0095 Hours
2765 Get hand truck and place components on truck	.0089 Hours
2766 Pull hand truck with comp. approx. 15 feet	.0041 Hours
2847 Pick up part and move to assembly:	
medium	184.4 TMU
large	227.6 TMU
	250.7 TMU

Engineered Performance Standards

Page 3

3196	Dip rag in solvent and squeeze	244.2	TMU
3197	Clean small part before installing	414.0	TMU
3208	Wipe grease from finger	159.4	TMU
3209	Wipe rough surface	145.2	TMU
3210	Part, clean grooves/concave corners only	301.4	TMU
3212	Part, clean with rag, part on bench	486.8	TMU
	medium	257.6	TMU
	small		
3214	Wipe large part, large fixture, machine column with towel	193.3	TMU
3230	Wipe oily threads or parts	182.1	TMU
3231	Wipe part (small)	412.3	TMU
	(large)	1510.4	TMU
		3526.2	TMU
3241	Part small wipe with rag	50.0	TMU
3248	Adjust each jack to exact height under part	259.5	TMU
3273	Position small wrench to nut or bolt and remove after use	63.6	TMU
3289	Position part in a complex fixture	710.3	TMU
3293	Remove each part from simple fixture	39.0	TMU
3294	Remove each part from average fixture	56.9	TMU
3295	Remove part from complex fixture	239.6	TMU
3296	Remove part from centers	29.0	TMU
3304	Unfold drop cloths or fold	382.7	TMU
3305	Drag or position hose per occurrence	170.0	TMU
3311	Remove pins, gasket and scrap material and set aside	251.7	TMU
3358	Jack, place under rail and tighten, raise jack one stroke	144.9	TMU
3359	Handle, place in jack	75.2	TMU
3400	Kneeling on knee boards, move to next location	625.2	TMU
3402	Get and place nut on bolt and engage threads	86.8	TMU
3406	Nut, seat with wrench and remove wrench	191.3	TMU
3532	Pick up stepladder and put down	316.5	TMU
3533	Climb and descend tower	.0373	Hours
3534	Climb truck, ladder to tower, ladder and return	.0086	Hours
3561	Jack, adjust to approximate height	174.6	TMU

Engineered Performance Standards
Page 4

3739	Get out of pick up truck	.0016 Hours
3740	Get into pick up	.0030 Hours
3749	Move funnel into oil hole and remove -	85.5 TMU
3800	Obtain scale measure and aside	138.0 TMU
3802	Door (office), unlock	143.4 TMU
3803	Unlock and open window	81.9 TMU
3804	Close and lock window	1516.9 TMU
3820	Open and close cabinet door	214.4 TMU
3821	Dispose of rags, paper, etc. in trash can located outside of building	2376.3 TMU
3822	Cleanup of the job location	.0718 Hours
3823	Empty scrap metal container and return	
3824	Wash hands	.0240 Hours
3835	Clean out tank (inside and out)	.0307 Hours
3837	Water, wash down job site (300 sq. feet)	.03 Hours
3842	Walk unobstructed or with load to 50 pounds per pace (walk 10 paces)	150.0 TMU
3843	Walk obstructed or with load over 50 pounds per 10 paces (walk 10 paces)	170.0 TMU
3855	Check out or in tool	2209.0 TMU
3861	Tool, small, obtain and place aside	64.3 TMU
3869	Get tool from carrying bag and give to stock clerk	204.4 TMU
3871	Obtain tool from clerk and place in carrying bag	195.7 TMU
3874	Pick up rag or tool and lay aside	120.5 TMU
3875	Obtain note pad from pocket and return	201.6 TMU
3884	Pick up rag or tool and lay aside	120.5 TMU
3889	Jack, get from under rail	100.5 TMU
3903	Carry heavy part from tool crib to truck location and return	635.3 TMU
3904	Load heavy tool onto truck and unload from truck	379.5 TMU
3905	Pick up supplies and/or equipment and lay aside	764.7 TMU
3908	Wind rope around motor wheel	.0025 Hours
3909	Button depress (doorbell or similar)	45.4 TMU
3910	Pull rope to start motor	.0008 Hours
3911	Shut motor	.0010 Hours

Engineered Performance Standards

Page 5

3912	Turn machine on or off	194.2 TMU
3913	Start or stop compressor	.0030 Hours
3915	Put work gloves on hands and remove.	.0048 Hours
3921	Check fuel, oil, cooling water and other gages before starting	.0113 Hours
3922	Check boom, operation, including brakes, clutches, governor control, lever and stop control upon starting, or lock housing, secure brakes, disengage clutch and raise boom upon securing	.0046 Hours
3923	Obtain and examine stub	276.0 TMU
3924	Fill out material "chit" and sign	1063.2 TMU
3925	Insert stock number on, or sign stub requisition	222.9 TMU
3926	Sign instruction sheet after job.	191.2 TMU
3927	Waiting time for air pressure to increase and decrease	.0209 Hours
3928	Pre-planning on average emergency/service call	.034 Hours
3932	Pick up carrying bag and set down	
3933	Move equipment or material sised at job site and move back after job	412.5 TMU
3935	Move heavier tools or equipment to truck location. Move from truck location to job site.	2009.8 TMU
3940	Part pick up and set down	180.4 TMU
3942	Slide or push heavy object near and return (2 Men) elapsed time	.0142 Hours
3944	Obtain hand box - replace	370.4 TMU
3945	Obtain tool box from shelf and return	438.8 TMU
3947	Move tools or material on job site	.0131 Hours
3948	Put hose in pick up (per section)	.0063 Hours
3950	Pick up material or tools O set down after moving them	251.4 TMU
3952	Hand crank gas starter motor for diesel (cold starting)	.0330 Hours
3953	Warm up diesel engine to rated operating temperature	.0719 Hours
3954	Crawler crane travel - 300 yards	.3410 Hours
3955	Wait on test per 6 minutes $\frac{6 \text{ Minutes}}{60 \text{ Min/hr}}$.1000 Hours
3959	Water, flush inside of equipment	.0280 Hours
3960	Water, wash down inside of tank	.0225 Hours
3964	Phone, dial for transportation after completion of job	1119.0 TMU
3965	Remove or replace tarpaulin on material pile	734.7 TMU

Engineered Performance Standards

Page 6

3966	Tripod (with vise) set up to use	313.4 TMU
3968	Verbal instructions get from supervisor	.1211 Hours
4005	Dial supervisor on telephone	235.3 TMU
8034	Remove and reassemble ball, roller, or sleeve bearing from shaft and rotor or armature, wire brush, clean & inspect motor	.1592 Hours
4150	Jack, place under rail and tighten, raise jack each additional stroke	16.2 TMU
4105	Turn screw 360 degrees	24.0 TMU
4123	Wipe machine table, vise, surface gage, or square	80.8 TMU
4124	Position part or fixture against stop (each stop)	34.9 TMU
4125	Pick up and lay aside medium part	77.5 TMU
4126	Retighten vise by hand	34.1 TMU
4127	Measure, mark with pencil using a pattern (per sign)	219.0 TMU
4128	Vise, close and open vise on object	230.0 TMU
4129	Adjust vise as necessary (open or close)	53.5 TMU
4131	Position tool to work	103.6 TMU

OPERATION SUMMARY

OPERATION CODE

003

DATE _____

DATE
10-84

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OF

L

OPERATION No.

OPERATION

'CHECK ENGINE OIL

DEPARTMENT

MAINTENANCE

DIVISION

Transportation

DIVISIONAL DEPARTMENT

DIVISIONAL DEPARTMENT
Preventive Maintenance

EQUIPMENT

TRUCK

ANALYST

Barb Faison

LINE
No.

DESCRIPTION

UNST

REFERENCE

ELEMENT
TIME
TWO

FREQ.

TOTAL
TIME

1. Visual inspect large part	Occ.	—	1061.1	2	2122.2
2. Remove and install grease cup	Occ.	3154	503.5	1	503.5
3. Wipe oily threads on part.	Occ.	3230	182.1	2	364.2

NATIONAL STEEL AND SHIPBUILDING COMPANY



TOTAL TIME

TOTAL WITH ALLOWANCE.....15

STANDARD ALLOWED HOURS PER

2989.9

3438.4

10344

[illegible]

OPERATION SUMMARY

OPERATION CODE	000000
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IN CODE
005

DATE _____

DATE Dec 84

PAGE

of

OPERATION No.

OPERATION

OPERATION
CLEAN AIR CLEANER - Add Oil

DEPARTMENT

MAINTENANCE

DIVISION

TRANSPORTATION

DIVISIONAL DEPARTMENT

DIVISIONAL DEPARTMENT PREVENTIVE MAINTENANCE EQUIPMENT ALL ROLLING STOCK ANALYST *Paul Kisson*

EQUIPMENT ^{ALL} ROLLING STOCK

ANALYSIS

Paul Yanson

LINE
No.

DESCRIPTION

UNIT

REFERENCE

ELEMENT
TYPE
TIME

FREQ.

TOTAL
TIME

1	Turn Machine on or off	Occ	3912	194.2	2	388.4
2	Position small wrench to nut or bolt and remove after use	Occ	3273	63.6	1	63.6
3	Remove part from complex situation	Occ	3295	239.6	1	239.6
4	Move tools or material on job site	Occ	3947	.0131h		1.572
5	Move gunnel into oil hole and remove	Occ	3749	85.5	1	85.5
6	Pour 24 oz. oil	Occ	3159	.0074h	4	1,776
7	Check fuel, oil, cooling, other gages	Occ	3921	.0113h	2	1,356
8	Wipe on machine table, vise, gage	Occ	4123	80.8	4	323.2
9	Put work gloves on hands & remove	Occ	3915	.0048h	2	576
10	Dip rag in solvent & squeeze	Occ	3196	244.2	3	732.6
11	Wipe large part, large fixture Machine Column with towel	Occ	3214	193.3	5	966.5
12	Hand, wipe with cloth or paper towel	Occ	3195	160.0	5	800
13	Pick up small particle off floor	Occ	2903	122.6	2	245.2
14	Lid, install on can	Occ	3176	159.7	2	319.4

NATIONAL STEEL AND SHIPBUILDING COMPANY

TOTAL TIME

9,444

TOTAL WITH ALLOWANCE.....15

15

STANDARD ALLOWED HOURS PER

LOC

10,860.6



OPERATION SUMMARY

OPERATION CODE

007

DATE _____

PAGE

or

OPERATION No.

OPERATIONS

CHECK BATTERY - Add Water

DEPARTMENTS

MAINTENANCE

DIVISION

Transportation

DIVISIONAL DEPARTMENT

DIVISIONAL DEPARTMENT
Executive Maintenance

EQUIPMENT

EQUIPMENT
Tok List, Truck, Car, Bus

ANALYST

LINE
No.

DESCRIPTION

MMIT

REFERENCE

ELEMENT	TIME	DATE	TIME	DATE
1	10:00	10/10/10	10:00	10/10/10
2	10:00	10/10/10	10:00	10/10/10
3	10:00	10/10/10	10:00	10/10/10
4	10:00	10/10/10	10:00	10/10/10
5	10:00	10/10/10	10:00	10/10/10
6	10:00	10/10/10	10:00	10/10/10
7	10:00	10/10/10	10:00	10/10/10
8	10:00	10/10/10	10:00	10/10/10
9	10:00	10/10/10	10:00	10/10/10
10	10:00	10/10/10	10:00	10/10/10
11	10:00	10/10/10	10:00	10/10/10
12	10:00	10/10/10	10:00	10/10/10
13	10:00	10/10/10	10:00	10/10/10
14	10:00	10/10/10	10:00	10/10/10
15	10:00	10/10/10	10:00	10/10/10
16	10:00	10/10/10	10:00	10/10/10
17	10:00	10/10/10	10:00	10/10/10
18	10:00	10/10/10	10:00	10/10/10
19	10:00	10/10/10	10:00	10/10/10
20	10:00	10/10/10	10:00	10/10/10
21	10:00	10/10/10	10:00	10/10/10
22	10:00	10/10/10	10:00	10/10/10
23	10:00	10/10/10	10:00	10/10/10
24	10:00	10/10/10	10:00	10/10/10
25	10:00	10/10/10	10:00	10/10/10
26	10:00	10/10/10	10:00	10/10/10
27	10:00	10/10/10	10:00	10/10/10
28	10:00	10/10/10	10:00	10/10/10
29	10:00	10/10/10	10:00	10/10/10
30	10:00	10/10/10	10:00	10/10/10
31	10:00	10/10/10	10:00	10/10/10
32	10:00	10/10/10	10:00	10/10/10
33	10:00	10/10/10	10:00	10/10/10
34	10:00	10/10/10	10:00	10/10/10
35	10:00	10/10/10	10:00	10/10/10
36	10:00	10/10/10	10:00	10/10/10
37	10:00	10/10/10	10:00	10/10/10
38	10:00	10/10/10	10:00	10/10/10
39	10:00	10/10/10	10:00	10/10/10
40	10:00	10/10/10	10:00	10/10/10
41	10:00	10/10/10	10:00	10/10/10
42	10:00	10/10/10	10:00	10/10/10
43	10:00	10/10/10	10:00	10/10/10
44	10:00	10/10/10	10:00	10/10/10
45	10:00	10/10/10	10:00	10/10/10
46	10:00	10/10/10	10:00	10/10/10
47	10:00	10/10/10	10:00	10/10/10
48	10:00	10/10/10	10:00	10/10/10
49	10:00	10/10/10	10:00	10/10/10
50	10:00	10/10/10	10:00	10/10/10
51	10:00	10/10/10	10:00	10/10/10
52	10:00	10/10/10	10:00	10/10/10
53	10:00	10/10/10	10:00	10/10/10
54	10:00	10/10/10	10:00	10/10/10
55	10:00	10/10/10	10:00	10/10/10
56	10:00	10/10/10	10:00	10/10/10
57	10:00	10/10/10	10:00	10/10/10
58	10:00	10/10/10	10:00	10/10/10
59	10:00	10/10/10	10:00	10/10/10
60	10:00	10/10/10	10:00	10/10/10
61	10:00	10/10/10	10:00	10/10/10
62	10:00	10/10/10	10:00	10/10/10
63	10:0			

FREQ.

TOTAL TIME

1	Turn machine on & off	OCC	2388	138.8	2	257.6
2	Inspect work	OCC	26.01	.0084hr	2	1,680.0
3	Put hose in pickup (per section)	SECTION	3948	.0063hr	12	7,560.0
4	Replace nut on both & engage threads	NUT	3402	86.8	12	1,041.6
5	Water, flush inside of equipment	OCC	3959	.0280hr	1	2,800.0

NATIONAL STEEL AND SHIPBUILDING COMPANY



TOTAL TIME

13,339.2

TOTAL WITH ALLOWANCE.....15

15,340.1

STANDARD ALLOWED HOURS PER

Occurrence

• 153

OPERATION CODE

009

DATE _____

10-31-84

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of

OPERATION No.

OPERATION

CHECK HYDRAULIC OIL LEVEL

DEPARTMENT

MAINTENANCE

DIVISION

Transportation

DIVISIONAL DEPARTMENT

DIVISIONAL DEPARTMENT PREVENTIVE MAINTENANCE

EQUIPMENT

FORK LIFT

ANALYST

LAST Earl Pearson

LINE
No.

DESCRIPTION

UNIT

REFERENCE

ELEMENTARY

FREE.

TOTAL

1	Turn switch on or off	Occ	2388	128.8	1	128.8
2	Cloth, obtain or put away	Occ	2901	52.1	2	104.2
3	Open or close oil valve	Occ	2400	72.5	2	145.0
4	Inspect work	Occ	2601	608.4	2	1,680.0
5	Remove and reinstall grease cup	Occ	3154	503.5	1	503.5
6	Part small, wipe with rag	Occ	3241	50.0	1	50.0

NATIONAL STEEL AND SHIPBUILDING COMPANY



TOTAL TIME

2,611.5

TOTAL WITH ALLOWANCE.....15.4

3,003.2

STANDARD ALLOWED HOURS PER

Occurrence: 030

010

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OF

OPERATION

10

OPERATION
DRAIN & Fill Hydraulic Tank (ONCE a YEAR)

DEPARTMENT

MAINTENANCE

DIVISION

TRANSPORTATION

DIVISIONAL DEPARTMENT

DIVISIONAL DEPARTMENT
PREVENTIVE

EQUIPMENT

ANALYST

LINE
No.

DESCRIPTION

UNIT

REFERENCE

ELEMENT	TIME	TIME
---------	------	------

FREQ.

**TOTAL
TMD**

1.	Turn in machine on or off	Occ	3912	194.2	2	388.4
2.	Remove & lay aside parts	Piece	2572	250.7	4	1002.8
3.	Pour or DRAIN oil per gallon from Crank case, gear box/es	Occ	1058	.0079h	1	474
4.	Clean Tank inside & out	Occ	3835	.0307h	1	1,842
5.	Flow 24 oz. oil	Occ	3160	.0074h	4	1,776
6.	Position part in complex fixture	Occ	4124	34.9	10	349
7.	Hand, wipe with cloth or paper towel	Occ	3195	160.0	3	480
8.	Lid install on can	Occ	3176	159.7	2	319.4

NATIONAL STEEL AND SHIPBUILDING COMPANY

TOTAL TIME

6,631.6

TOTAL WITH ALLOWANCE.....\$

15.

STANDARD ALLOWED HOURS PER

$.763$

7.62e.3



OPERATION CODE

013

DATE 10-84

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of

OPERATION No.

OPERATION

^{ON} OIL ALL CONNECTING SHAFTS AND LEVERS

DEPARTMENT

MAINTENANCE

DIVISION

Transportation

DIVISIONAL DEPARTMENT

DIVISIONAL DEPARTMENT
Preventive Maintenance

EQUIPMENT

FORK LIFT

ANALYST

Mark Faison

LINE
No.

DESCRIPTION

UNIT

REFERENCE

ELEMENT

FREE.

TOTAL
TIME

1.	Remove and reassemble ball, roller or sleeve bearing from shaft and rotor or armature, wire brush clean and inspect motor.	Occ.	8034	.1592	1	15920.0
2	Pick up and lay aside 3 medium parts	Part	4125	77.5	9	647.5
3.	Dip rag in solvent and squeeze	Occ.	3196	244.2	10	2442.0
4.	Wipe machine table, vice, surface gage or square.	Occ.	4123	80.8	9	727.2
5	Oil hole (No cover)	Occ.	3157	206.8	5	1034.0

NATIONAL STEEL AND SHIPBUILDING COMPANY



TOTAL TIME

20,820.7

TOTAL WITH ALLOWANCE...15.4

23,943.8

STANDARD ALLOWED HOURS PER

1.2394

02

PAGE

OF

OPERATION

21

OPERATION
LUBRICATE LIFT CHAINS with S.A.E. 10- Brush Applied

MAINTENANCE

DIVISION

TRANSPORTATION

SECTION/GROUP

PREVENTIVE MAINTENANCE

FORK LIFTS & CARRIERS

ANALYST

Book 100570

LINE
No.

DESCRIPTION

UNIT

REFERENCE

11-11-68

FREQ.

TOTAL
TWO

1	Turn machine on or off	Occ	3912	194.2	2	388.4
2	Wipe machine table, rise, surface gate, or square	Occ.	4124	80.8	6	484.8
3	Dispose of waste paper, etc. in trash can located outside of building	Occ.	3821	2376.3	1	2376.3
4	Put work gloves on hands and remove	Occ	3915	.0048 hrs	2	480.0
5	Spread oil with paint brush	Occ	3150	91.4	12	
*	outs extension time for (small part)					1,096.8
6	Wash, wipe with cloth or paper towel	Occ	3195	160.0	2	1,920

NATIONAL STEEL AND SHIPBUILDING COMPANY

TOTAL TIME

6,746.3

TOTAL WITH ALLOWANCE...15.3

STANDARD ALLOWED HOURS PER

776

7,758.3.



EQUIPMENT N°. _____

TYPE VEHICLE _____

DEPT. _____

CHECK LIST

SPECIAL REQUESTS

MODEL NUMBER _____

SERIAL NUMBER _____

DATE INSTALLED _____

DATE SERVICE STARTED _____

SERVICE RECORD
GROUP 1 - 40-50 OPERATING HOURS

MONTH
DAY

1. Clean Zerk Fittings and Lubricate
2. Change Engine Oil
3. Check Engine Oil
4. Change Oil Filter Element
5. Clean Air Cleaner — Add Oil
6. Grease Inner Slides
7. Check Battery — Add Water
8. Clean Hydraulic Sump Cap
9. Check Hydraulic Oil Level
10. Drain & Fill Hydraulic Tank (Once a Year)
11. Check Drive Axle and Transmission Lubricant
12. Drain & Fill Transmission
13. Oil — All Connecting Shafts and Levers
14. Replace Fuel Strainer
15. Check for Leaks — Gasoline — Oil — Water
16. Steam Out Radiator Core
17. Check Brakes — Master Cylinder
18. Check and Clean Engine Vent Pipe
19. Check Fan and Generator Belts
20. Check Differential and Transmission Vent
21. Lubricate Lift Chains with S.A.E. 10 — Brush Applied

MECHANIC (Initials)

ENGINE HOUR METER READING

ENGINEERED PERFORMANCE
STANDARDS FOR PUBLIC
WORKS MAINTENANCE

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NC.	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
11	(continued)								Move ends over other hand	2	M2B	10.4	M2B	2	Move ends over other hand
									Release wire	2	R11	4.0	R11	2	Release wire
									Reach to new spot	2	R7B	17.2	R7B	2	Reach to new spot
									Grasp wire	2	G1A	4.0	G1A	2	Grasp wire
									Ball separated end	2	M2B	10.4	M2B	2	Ball separated end
									Apply pressure		AP1	16.2	AP1		Apply pressure
												2.0	R11		Release wire
												15.0	R11B		Bench for wire cutters
												2.0	G1A		Grasp
												10.4	M2C	2	Move to protruding spot
												11.2	G2	2	Regrasp
												1.2	M2A	2	Close handles to cut
									Release wire	2	(R11)	4.0	AP1	4	Apply pressure
												1.2	M2A	2	Spread handles to open
												15.4	M2B		Lay aside cutters
												2.0	R11		Release cutters
												11.2	AP1C		Arise
												54.4			
511	Move door into position (per door)			.0170	1	.0170	1	.0170							
512	Nail, pre nail prior to assembly (continued)								Nail to position	M2C		11.0			
										G2		5.6			
										P1SF		10.3	W/C		
												5.6	P1SF		Position hammer
												53.4	M2B	6	Hammer up
										(R11)		50.6	M2A	6	Hammer down
												15.3			
513	Place, position to for fastener (continued)								From work area to place	R10B		25.8	R10B		From work area to place
									To assembly area	G1A		2.0	G1A		
										M10B		24.3			
									Hold assembly			30.7	M10C		
												53.2	T1RND	2	
												32.4	AP1	2	
												80.0	ET	4	
												29.2	EF	4	
												277.6			
514	Nail set, with nail punch (continued)								Punch to nail	M2C		11.8			
									On nail head	P2RE		16.2			
												14.6	M14B		Hammer over punch
												11.8	M2C		Hammer to punch
										M10B		12.2	M10B		
												66.6			

ELE- NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL NO. FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LW	TMU	RH	NO	DESCRIPTION - RIGHT HAND
316	(continued)											2.0 12.2 2.0 11.5 2.0 24.3 2.0	G1A M1OB RL1 R1OB G1A M1OB RL1		Grasp Pull free Release loop Reach to main rope Grasp Pull free Release
												262.5 x 2 (gen) 525.0			
317	Object (heavy), slide on floor 11-HIGH001										R2OB G1A M1OB35 RL1 R1OA G2 M1OB35 RL1	17.2 18.6 10.0 141.5 10.0 34.8 5.6 79.5 2.0	TBC1 R2OB G1A M1OB35 RL1 R1OA G2 M1OB35 RL1	2 5 5 5 4	Step around part Reach to part Grasp part Push part Release Reach back Regrasp Push part
												295.2 x 2 (gen) 590.4			
318	Obtain piece of framing timber from pile										G1A G2 M2B20	204.0 17.0 29.0 2.0 5.6 13.0 31.9 2.0 12.9	W12P0 S612C1 S G1A G2 M2B20 AS RL1 R12B		To lumber pile For piece on floor Grasp piece Arise with piece Reach for better control of piece
										G2		5.6	G1A		

MayFac P-701.3

Change 2, August 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART									
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LH	TRU	RH	NO	DESCRIPTION - RIGHT HAND			
344	(continued)											31.9 AKK						
												2.0 OJA						
												16.2 AF1						
												4.6 MPR			Turn to unscuple			
												5.6 D1R						
												15.8 M16R			Lay aside			
												2.0 RL1						
												15.8 R16R			To auger			
												2.0 OJA						
											M16R20	19.3 M16R20			Lift			
												31.9 AKK						
												74.4 TPC2			2 Turn around			
												225.0 M16P			To tool box			
												19.3 M16R20			In tool box			
												29.0 B			Lay down			
												2.0 RL1						
												31.9 AB			2 Turn around			
												74.4 TPC2						
												75.0 WSP			Air on and off to bleed			
												13.8 M16P						
												2.0 RL1			To disengage hose			
												15.8 R16R						
												2332.2						
345	Turn air off and on and bleed tool								This motion pattern repeated following hook up of air tool			31.2 TPC2			Turn towards air valve			
												60.0 WSP			To air valve			
												21.5 R24B			To handle			
												2.0 OJA						
												16.2 AF1						
												69.0 M16R		10	Close valve			
												64.0 R4B		10	Close valve			
												16.2 AF1			Tighten			
												2.0 RL1						
												37.2 TPC2			Turn towards auger			
												60.0 WSP			To auger			
												29.0 KKK						
												15.8 R16R			To auger handle			
												2.0 OJA						
												432.1						
												K 2						
												84.2						

Change 1, Jan. 1974

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OBS	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1051	Adjust exhaust line								Reach to line Grasp Move line to Proper position Regrasp to Position Release To balance		R: DB G1A AF1 M6B GP P1GF RL1 R2OE	14.6 2.0 11.2 11.8 5.6 11.2 2.0 16.7 10.1			
1053	Mill, mount, shell type mounting (center screw) 605-MSUM401								Left hand may follow Same motion pattern as right hand Regrasp cutter to hold	M1LC P3SE MPC P3SSD APP GP	18.7 43.0 5.2 52.1 16.2 5.6 140.8	M1LC P3SE MPC P3SSD APP RL1			Move cutter to spindle Move cutter on spindle Move cutter on spindle Position on key Push cutter on Release cutter
1054	Mill, remove, shell type mounting (center screw) 605-MSUMR01								Reach to cutter Grasp cutter Work mill off	R2OD G1A APP M2B	19.8 2.0 48.6 51.4 17.8 2.0 16.2 4.6	M6A M6B R2OD G1A			Tap with mallet To loosen cutter Reach to cutter Grasp cutter

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Change 2, August 1971

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RM	NO	DESCRIPTION - RIGHT HAND
1054	(continued)								Disengage mill	0CE		16.2 4.6 7.5 28.3	APB IEB ICE		Work mill off Disengage mill
1055	Mill (face), mount, spindle mount (four screws) 605-MSUMR02								Left hand follows Motion pattern on Right hand Reengage mill	0P		31.5 44.0 52.1 5.6 2.0 136.2	1PCC15 1PCE 1PSSD RL1		Move mill to location under spindle Position mill on spindle Position mill on keys Release mill
1056	Mill (face), remove, spindle mount (four screws) 605-MSUMR02											40.6 53.4 104.0	16A 17B	6	Tap mill Loose
1057	Point, mark with marking instrument U-BLOPH01											5.2 16.2 16.2 7.3 4.6 43.5	17C 17SE APB EF 16B		Move scriber to work Position scriber to scale Scribe point Check mark Move scriber away
1058	Pour or drain oil per gallon from crank cases, gear boxes etc. of machinery and equipment	.0070	.0045	.0250	4	.0065	1	.0065							
1059	Prepare to wipe oil or grease on large part											290.0 18.2 312.0 682.0 270.0 119.0 1718.2	B M20B AB SSC2 B AS	10 10 20 10 10	To part Rag to part Lower portions
1060	Remove approximately 1 quart of 2130 oil from crank case of machine with 3/8 pint capacity hand suction gun	.0250	.0110	.0405	3	.0135	1	.0165							
1061	Obtain wrapping paper, wrap and scotch tape--assembled sign--12" long, of 1-1/2" triangular wooden block								Reach to wrapping paper on shelf Grasp Move to work bench	R16B 01A M12B		15.8 2.0 13.4	R10B 01A M6B		Reach to assembly on bench Grasp Move to a position or paper preparatory to wrapping

Form P-701.3

Change 2, August 1974

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OPS	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LN	TMU	AN	NO	DESCRIPTION - RIGHT HAND
1095	Set circular saw teeth with hammer and block (per tooth)								Reach for blade	1	RFP	10.0	MHP		Move hammer up
									Grasp	1	G1P1	7.0	LF		Position tool
									Move blade	1	MHP	10.0	MHA		Move hammer back
									Regrasp	2	G1P	10.1	MHP		Move blade
												7.0			
												11.2			
												1.0	RL1		Release
												10.0			
1097	Obtain fork truck and move to receive part														
												51.2	TBC1	1	
												50.0	W1CP	2	To and from truck
									Reach to cab		RCPB	51.2	TBC1		
									Grasp handhold			18.0	RCPB		Reach to cab
												2.0	G1A		Grasp handhold
												17.1	IMHC		Step on rung
												100.5	IMHP		Climb into cab
									Symbols and time values for fork truck operations from data developed by Naval Supply Systems Command			50.0	A		Start
												540.0	P1OE		Run forward
												55.0	SO		Stop
													(F1.CP		Position pallet on forks)
												50.0	A		Start
												55.2	F1OE		Forward 14 feet
												51.1	T1R		Turn
												55.0	F1OE		Forward 14 feet
												55.0	SO		Stop
												250.0	IMHP		Raise forks
												15.0			
1098	Insert and remove master copy type in beveled copy holder (per letter)											1.0	R1C		Reach to copy type letter
												2.0	G1A		Grasp
												12.0	M1OB		Heave copy type to left hand
												1.0	RL1		Release copy type
									14.2 letters per set up			5.0	TBC1		Turn body 180°
												1.0	TBC1		Turn body 180°

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LM	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1102	(continued)											2.0 30.0 17.0 174.8	RL1 W2F FF13:1		Release clutch Back to Machine
1103	Set to scribe piece with scriber										RL2B G1P G2	1.1 4.5 4.6 16.1 16.2 59.1	M14C P2SE		Reach to scriber Grasp scriber Move scriber to work Position scriber
1107	Jaw, remove from chuck, reverse and replace 60X-HSUJRO1											12.3 2.0 15.2 19.7 5.6 222.8 5.6 5.7 9.4 6.7 6.7 13.7 5.6 222.8 14.6 2.0 577.0	R12B G1A M12C P2SSE G2 16CB G2 M3B T14'OG M3C G3 P2SSE G2 16CB M14B RL1		To wrench To socket Spin wrench to move 4 Remove jaw Rotate jaw Move jaw to chuck Wrench to socket Spin wrench Aside

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1109	Sling, put around part or object 921-MHSP01								Reach under part	R07R		10.7 22.3 11.4	M16C M12B G1		Move sling Move sling under part
									Transfer sling to L.H.	G3		5.6	G1		Transfer sling to L.H.
									Draw sling under part	M20B		10.2	R07B G1A		Reach to sling Grasp sling
									Move ends of sling together	M12B		15.4	M12B		Move ends of sling together
									Regrasp sling	G2		10.3	M6C		Move end to loop
									Release loop	R11		5.6	PISE		Position end to loop
									Reach to end of loop	R4B		6.9	M4B		Move end through loop
									Transfer to L.H.	G3		6.4	G3		Transfer to L.H.
									Hold			5.6	R14B		Reach to sling
												14.4	G1A	4	Position
												8.0	M6C	4	Sling
												41.2	R11	4	On
												8.0	R6B	3	Part
									Draw sling tight	M12B		25.8 11.0 24.4			
1110	Sling, attach to hook 921-MHSA01								Twist sling	T180B		10.1	R8B		Reach to sling
									Fold sling	M6A		2.0	G1A		Grasp sling
									Regrasp folded sling	G2		9.4 8.1			
												5.6	R11		Release sling
												12.9	R12B		Reach to hook
												2.0	G1A		Grasp hook
									Move sling to hook	M6C		15.4	M12B		Move hook toward sling
									Position loop on hook	PISE		10.3			
									Move loop on hook	M6B		5.6			
									Regrasp hook and sling	G2		8.9			
									Draw sling tight	M12A		5.6 12.9 106.8			Release sling
1111	Sling, remove from hook 921-MHSP02											17.2	R18B		Reach to top strand
												2.0	G1A		Grasp top strand
												6.9	M4B		Move top strand off hook
												2.0	R11		Release top strand
												6.4	R4B		Reach to second strand
												2.0	G1A		Grasp second strand
												6.9	M4B		Move second strand off hook
												2.0	R11		Release second strand
												45.4			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1116	(continued)											20.7	MAB	3	In slot
												52.5			
1117	Wrench, place on and remove from draw bar lock nut 605-RHNP01								Move wrench to draw bar		M30C	10.7			
									Position wrench on locknut		P256D	25.4			
									Move onto post		M1F	2.0			
									Move off nut		M1F	2.0			
									Disengage wrench and nut		DCE	7.5			
												17.5			
1118	Set protractor or bevel square								To protractor		[R14B	14.4			
											G1B	4.5			
									To center of bench		M14B	14.6			
									Grasp away from blade		G2	5.4			
												9.6	GCB		To locknut
												4.5	G1B		
												16.2	AF1		Loosen locknut
												2.0	M1B		
												2.0	RL1		Remove hand
												5.3	RSE		To blade
												3.5	G1F		
												8.0	M/C		Move blade to correct setting
												16.2	P256F		Check setting
												7.3	EF		Remove hand
												2.0	RL1		Again check setting to locknut
												7.3	EF		
												7.3	R1D		
												3.5	G1B		
												2.9	M1B		Tighten locknut
												16.2	AF1		
												2.0	RL1		Remove hand
												7.3	EF		Check setting
												20.0	ET	32 16	Check angle of blade
									Lay aside		M16B	15.8			
									Remove hand		[RL1	2.0			
											[R10E	10.5			
												208.4			
1119	Position framing square to straight edge											21.5	R24B		To square
												3.5	G1B		Pick up and regrasp square
												5.6	G2		To work
												18.2	M20B		
												42.9	SS20C2		Move against straight edge
												10.2	M20A		
												15.2	ET	16 16	Look back to square
												7.3	KF		Identify

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL MO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	MO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1117	(continues)											14.2 8.0 15.2 7.5 14.2 7.5 2.0 16.7 721.3	ET M/C ET EF P2SE EF RL1 R2OE	16 16 16 16 16 16 16 16 16	Look back to square Move to position Again look to point Check alignment with square Position square to point Check alignment Remove hand
1120	Wrench, place on and remove from nut of thurston chuck 605-BSUWP02								Move wrench to end of mill Position wrench to end of mill Move wrench to nut Position wrench to nut Position wrench to hex Release wrench Reach to wrench handle Grasp wrench Hold Move wrench off nut Clear cutter with wrench Move wrench to R.H. Transfer wrench to R.H.	M/C P1SE M/C P1SE P2SSE RL1 R10B G3 M4B DIE M12AB G3	11.8 5.6 8.0 5.6 14.7 2.0 11.5 5.5 11.6 4.0 18.7 5.6 107.2	M/C M/C G3 R12A G3	4 3	Move wrench to end of mill Hold Transfer wrench handle to L.H. Reach to handle of wrench Transfer wrench to R.H.	
1121	Nut (thurston chuck), loosen or tighten with mallet 605-MSUN101								Hold			5.6 41.4 38.7 85.7	P1SE M4B10 M4A10	4 3	Position mallet to wrench Move mallet away from wrench Strike wrench
1122	Wrench, place on and remove from arbor nut 605-BSUWP03											37.2 22.1 19.7 2.9 4.0 18.2 18.6 122.7	TBC2 M2OC P2SSE M1B DIE M2OB TBC1		Turn to end of arbor Move wrench to nut Position wrench on nut Move wrench off nut Disengage wrench off nut Move wrench aside Turn to machine

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE ON SELECTED	LEVEL NO. FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1129	Use dividers for stepping off points											4.0 21.8 15.6 8.0 52.4	MC M2B EF MC		Move to next point Scribe arc
1130	Weight (speed), attach or detach to/from lawnmower 639-HQNA01								Benl and reach To weight chain To cutter arm Weight to cutter arm Weight chain Arise U-TEIAFAA		B B2PT G1A M3CC PISE RL1 AB	2.0 2.0 30.7 5.6 2.0 31.4 4.0 104.7			
1131	Part, large, clean with rag, additional square feet, part on floor U-BCLPC04											60.4	M12B	6	Wipe one square foot
1132	Part, large, clean with rag, 1st square foot, part on floor U-BCLPC03										M12B G1A RL1	18.2 2.0 80.4 2.0 102.6	M20B M12B	6	Rag to part Wipe one square foot
1133	Prepare to use wire brush or scraper--part on floor										R18B G1A M16B RL1	29.0 18.2 2.0 15.8 2.0 18.2 31.2 117.1	B M20B M16B M20B AB		Obtain tool To work Both hands Tool to part Use tool Away tool
1134	Surface, clean with wire brush, one square foot U-BCLSC05									14 14 14	AFB MB MB	224.8 174.6 174.6 474.0	AFB MB MB	14 14 14	
1135	Surface, clean with scraper, smooth surface, unobstructed U-BCLSC01											127.2 160.8 160.8 448.8	AFA M12B M12B	17 12 12	Pressure at beginning of scrape Scrape Return

ELE MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RM	NO	DESCRIPTION - RIGHT HAND
1136	Surface, clean with scraper, rough surface, obstructed U-BCLSC04											500.8 331.2 331.2 1171.2	ATA MHB MHB	48 48 48	Pressure Scrape Return
1137	Lever, turn on and off (air valve or similar) U-MACT01											37.2 4.0 32.4 24.4 4.0 102.0	R2OB G1A ATB M1OB RL1	2 2 2 2 2	Reach to lever Grasp lever Turn lever
1138	Surface, clean with air U-BCLSC06											160.0	MHB	20	Move hose back and forth
1139	Tool (electric power), un- wind cord and connect plug U-MIPTU01								L.H. hold power tool			10.1 2.0 5.7 16.2 5.6 7.5 6.9 2.0 8.6 2.0 100.0 5.6 22.1 19.7 2.0 215.0	RBB G1A MJB ATB G2 DZE MHB RL1 RBB G1A M12Pm G2 M2OC F2SSE RL1		Reach to plug Grasp plug Free plug Unwind cord Regrasp plug Move socket Plug in Release plug
1140	Tool (electric power), dis- connect plug and wind cord U-MIPTD01											18.6 2.0 7.5 2.0 18.6 2.0 100.0 5.6 6.9 2.0 8.6 2.0 8.0 5.6 32.4 5.6 2.5 2.0 6.4	R2OB G1A DZE RL1 R2OB G1A M12Pm G2 MJB RL1 RBB G1A M1C G2 ATB G2 M1A RL1 RBB		Reach to plug Grasp Unplug Plug To cord Grasp Wind around body Cord Plug thru HDL Cord Reach to plug Grasp Move plug to wire Plug Push in under cord Plug Pull tight Plug To tool

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELS TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
1150	(continued)								Release		RL1	2.0 166.0	RL1		
1151	Wrench, adjust, large open end 6XX-BT1AM01								Release handle		RL1	2.0			
									Reach to thumb screw		R6A	7.0			
									Grasp	15	G1A	30.0			
									Turn	15	M1B	45.5			
									Release	15	RL1	30.0			
									Reach back	14	R1A	35.0			
									Press when necessary	3	APA	31.8 179.3			
1157	Part (small), remove from machine and aside to floor 6XX-MOENF01											18.6 3.5 4.0 12.2 18.6 15.0 2.0 18.6 15.0 107.5	R20B G1B D1E M10B TBC1 W1P RL1 TBC1 W1P	Reach to part Grasp part Remove from machine Move out of machine Walk to bin Release part Walk to machine	

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Change 2, August 1974

NavTac P-701.3

Charge 2, August 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
1161	Obtain medium size part and position								Grasp under edge Pull up part		G1A AP15	18.6 45.0 29.0 3.5 16.9 2.0 5.6	TBC1 W3P B G1B M2B30		Walk to part Bend Grasp Lift end
									Position one end		M12C15 P28BD	31.9 37.2 45.0 34.1 23.4 25.3	AP15 AB TBC2 W3P S3C2 M12C15		Pull up part Arise with part Turn to machine Walk to machine Step into position Move to position
									Align other end Release		M4C15 F1BE RL1	7.6 25.3 35.0 5.6 7.6 5.6 2.0	ET15/50 P28BD M4C15 F1BE ET15/50 RL1		Look to other end Position other end Lower piece Align on end Look to other end Release
1162	Part (medium), clean before installing GXX-MCLCP01											386.2			
										3	M6B15 T1208	48.0 6.8 2.0 9.4 2.0	M6B15 T1208 RL1 T1808 G1A		Move part in and out Turn part and reverse grasp
										3	M6B15	48.0	M6B15	3	Dip and move part in solvent
									Release part Reach to rag Grasp rag Move rag to part Grasp part in rag Clean part--both sides	34	M10B15 RL1 M30B G1A M30B G1A M6B	19.9 2.0 25.8 2.0 24.3 2.0 360.4	M10B15		Set down part
									Move rag to pocket		M30C P28E RL1	8.5 2.0 9.4 2.0 8.5 30.7 16.2 2.0	T90H RL1 T1808 G1A T90H		Turn part over
												691.9			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THU	RH	NO.	DESCRIPTION - RIGHT HAND
1165	Part (small), adjust position 6XX-MTIAPO1								Reach to punch Grasp punch Lift punch	R10B Q1A M10B		18.6 15.0 11.5 2.0 11.5 2.0 12.2	TBC1 W1P R10B Q1A M10B TBC1 W1P		Walk to tools Reach to hammer Grasp hammer
									Move punch to part Position punch to part	M10C P18E		15.0 13.5 5.6 51.8 29.1			Lift Walk to work
									Move punch aside	M20B RL1		18.6 2.0 206.6	M6B M6A M20B RL1	3 3	Raise hammer Strike punch Move hammer aside Release
1166	Part (medium), adjust position 6XX-MTIAPO2								Reach to bar Grasp bar Lift bar	R10B Q1A M10B		18.6 30.0 11.5 2.0 11.5 2.0 12.2	TBC1 W2P R10B Q1A M10B TBC1 W2P		Walk to tools Reach to hammer Grasp hammer
									Move bar to part Position bar to part	M10C P18E		18.6 30.0 13.5 5.6 106.0 97.0			Lift Walk to work
									Move bar aside Release	M20B RL1		18.6 2.0 378.7	M6B M6A M20B RL1	10 10	Raise hammer Strike bar Move hammer a Release
1167	Apply grease to small part								Turn part over	T150B O2		18.6 15.0 18.6 2.0 18.2 18.6 15.0 27.6 9.4 5.6 27.6 176.2	TBC1 W1P R20B Q1A M20B TBC1 W1P M6B M6B	4 4	Walk to grease Reach to grease Pick up grease Walk to part Rub grease on part Rub grease on part
1167	Attach clamp to overhead beam for chain hoist, or remove								Release ladder Reach to clamp	RL1 R24A		2.0 20.0	M24A10		Move clamp to L.N.

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ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RN	NO.	DESCRIPTION - RIGHT HAND
1172	Position wood blocks to receive large part											37.2 150.0 58.0 7.0 10.5 11.2 63.8 300.0 29.0	TBC1 WSP B G18 M185 G2 AB W20P B	2 2 2 2 2 2 2 2 2	Walk to block Bend Grasp blocks Arise Walk to storage area Bend down

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RW	NO.	DESCRIPTION - RIGHT HAND
1172	(continued)								Move other block			21.5	M20B5		Place one block
									Release		M12B5	2.0	RL1		Release
											RL1	16.4			
												2.0			
												31.9	AB		
												100.0	W20P		
												18.6	TBC1		
												109.1			
1173	Position large part on fork truck											37.2	TBC1	2	Step around part
											R10B	11.5	R10B		Reach to part
											G1A	2.0	G1A		Grasp part
											M24C25	41.7	M24C25		Push part
									Release chain		M24C		G1A		Wait--part lowered
									Reach to chain fall	5	M130A	126.6	M130B	6	Pull chain down
									Grasp chain		G24C		RL1		Release chain
									Pull chain down	5	M130B	105.5	M130A	6	Reach to chain
												324.5			
1174	Position large part											21.5	R24B		Reach to part
												2.0	G1A		Grasp part
											M6C25	22.3	M6C25		Move part
												16.2	P28E		Position
									Pull hoist chain	5	M130A	105.5	M130B	5	Pull hoist chain
									Release chain	5	M130B	105.5	M130A	5	
													G24C		Grasp chain
												21.5	R24B		Reach to pin
												2.0	G1A		Grasp pin
												25.5	M24C		Move to part
												5.6	P15E		Position in one part
												6.7	M3C		Move into part
												11.2	P15D		Position in 2nd hole
												16.2	AP1		Press to align parts
												5.7	M3B		Move into place
												2.0	RL1		Release
									Reach to pin		R24B	21.5			
									Grasp		G1A	2.0			
									Pull free		M6B	10.6			
											D2E	7.5			
									Move to pocket		M24C	25.5			
									Position		P15E	5.6			
									Release		RL1	2.0			
												444.1			
1175	Remove sling from large part											21.5	R24B		Reach to chain
												2.0	G1A		Grasp chain
										5	M130A	105.5	M130B	5	Lower hook slightly
												2.0	RL1		Release chain
											R12B	12.9	R12B		Reach to rope
											G1A	2.0	G1A		Grasp
												10.6	M6B		Move sling off hook
									Release hook		RL1	2.0			
									Reach to loop		M6B	10.1			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMV	RN	NO.	DESCRIPTION - RIGHT HAND
1175	(continued)								Grasp loop		G1A	2.0			
									Pull		AP1	16.2			
									Free loop		M5B	8.9			
												2.0	RL1		Release sling
												8.6	R6B		Reach to loop
												2.0	G1A		Grasp
												12.2	M10B		Pull free
												2.0	RL1		Release loop
												11.5	R10B		Reach to main rope
												2.0	G1A		Grasp main rope
												24.5	M30B		Pull free
												2.0	RL1		Release
												262.5			
1176	Scribe 90° arc with two men trammel (per man)											34.0	W2PO		Helper to work
												18.6	TBC1		
												69.4	KCK		Kneel down
												29.0	B		Bend forward
												22.1	M2OC		Position trammel
												47.8	FJNSE		point to center point
												7.3	EF		Check position
												5.6	G2		Regrasp and hold
												10.3	M6C		Craftsman positions
												21.0	FJNSE		trammel point
												44.2	M2OC	2	Scribe with trammel
												28.6	LM12	2	Crawl forward
												5.6	G2		Regrip
												12.2	M10B		Remove from work
												31.9	AB		Stand up
												76.7	AKCK		
												34.0	W2PO		Return to bench
												498.5			
1177	Move part aside on fork truck and move truck aside								Symbols and time values for fork truck operations from data developed by the Naval Supply Systems Command			150.0	D5ONIM		Lower pallet and forks
												41.6	AIM		Start
												40.0	R10IM		Back up 10 feet
												91.7	TNL		Turn
												40.0	R10IM		Move backwards
												35.0	SIM		Stop and start
												41.6	AIM		
												40.0	F10AM		Move forward
												91.7	TFR		Turn
												20.0	F5IM		Move forward
												55.0	S0IM		Stop
												60.0	D12N		Lower part to floor
												50.0	A		Start
												34.0	R10E		Back up 10 feet
												91.7	TFL		Turn
												33.0	SO		Stop
												50.0	A		Start
												171.0	F45E		Move forward
												55.0	SO		Stop
												1617.0			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		INITIAL VALUE 2.1 PM 9	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THW	RN	NO.	DESCRIPTION - RIGHT HAND
1178	Place skid or pallet on forks of truck											18.6 75.0 29.0 2.0 16.2 31.9 18.6 60.0 18.6 26.4 14.7	TBC1 WSP S G1A AP1 AS TBC1 W4P TBC1 M2OC10 P18SD		Walk to pallet Stoop Grasp Pick up pallet
												17.4 2.0 13.1 2.0 28.8 2.0 378.3	M1OC10 RL1 M2OA G1A M2AA10 RL1		Walk to truck Move pallet to truck Position pallet on forks Move pallet on forks Release Reach to end of pallet Grasp Push onto forks Release
1179	Obtain fork truck, obtain large part from stand and move to work											37.2 300.0 37.2 18.6 2.0 19.1 100.5 50.0 342.0 33.0 ---	TBC1 W1OP TBC1 M2OB G1A LM16 LM28 A FYOE S (RLC2)	2 2 2 3	To and from truck Reach to cab Grasp handhold Step on rung Climb into cab Start Run forward Stop Position pallet on forks)
												50.0 53.2 91.7 53.2 33.0 202.0 133.0 37.6 40.0 91.7 41.6 53.0 1921.6	A P14E TTR P14E SO U6OW JHE U121M N101M TTR ALM SO1M		Start Forward 14 feet Turn Forward 14 feet Stop Raise forks Into pallet Up 12" Back up Turn Start forward Stop
1183	Roller, filling wheels with water, per 1800 sq. ft.	.0531	.0598	.9305	20	.0463	1.00	.0463							
1184	Move machine roller onto area and away			.0500	1	.0500	1	.0500							
1185	Cultivate shrubs without flowers, 3' x 10'	.017	.008	.145	12	.012	1.05	.0130							

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TNU	RN	NO	DESCRIPTION - RIGHT HAND
1564	Rotate boom 90° - 100-ton floating crane			.0110	1	.0110	.755	.0083							
1565	Rotate boom 75° - 60-ton floating crane	.0098	.0072	.0754	9	.0084	.755	.0063							
1566	Boom up or down - 100-ton floating crane (per foot)			.0009	1	.0009	.755	.0007							
1568	Equipment, heavy, floating-moor or unmoor by tug	.3231	.2227	1.6374	6	.2729	.755	.2061							
1569	Equipment, heavy, floating-move by tug (per mile)	$\frac{8.5 \text{ knots/hr}}{0.4 \times 1.125} = 9.6 \text{ MI/hr}$ $\frac{1}{9.6} = .104 \text{ hr/MI}$.755	.0793						
1570	Air drill; counterbore 4 inch diameter x 4 inches deep in timber	.0940	.0210	.2640	10	.0268	1.0	.0268							
1571	Air drill 1-1/8 inch diameter hole through 12" x 12" timber	.0110	.0073	.1824	20	.0091	1.0	.0091							
1572	Air drill; 2-1/4 inch diameter hole through three 12" x 12" timbers	.0850	.0650	.3770	5	.0754	1.0	.0754							
1573	Air drill; ream 1-5/16 inch diameter hole through 1-1/8 inch diameter hole through four 12" x 12" timbers	.1700	.0960	.6020	5	.1204	1.0	.1204							
1574	Lower No. 2 hook loaded or unloaded - 100-ton floating crane (per foot)	$\frac{.0720}{70'}$	$\frac{.0261}{70'}$	$\frac{.1162}{300'}$	5	.0004	.755	.0003							
1575	Raise or lower No. 1 hook loaded or unloaded - 100-T floating crane (per foot)	$\frac{.1120}{120'}$	$\frac{.0716}{85'}$	$\frac{.2966}{315'}$	6	.0009	.755	.0007							
1576	Raise No. 2 hook loaded or unloaded - 100-ton floating crane (per foot)	$\frac{.0690}{80'}$	$\frac{.0575}{80'}$	$\frac{.2179}{320'}$	4	.0007	.755	.0005							
1577	Raise or lower No. 1 hook loaded or unloaded - 60-ton floating crane (per foot)	$\frac{.0740}{60'}$	$\frac{.0248}{60'}$	$\frac{.2340}{480'}$	8	.0005	.755	.0004							
1578	Feary; position to pile and remove from.									02 M12B		5.6 13.4	02 M12B		Handle Spike into pile

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LN	TWU	RH	NO.	DESCRIPTION - RIGHT HAND
1533	Set up and take down step ladder (up to 12 ft. length)								Grasp side		G1A	29.0 2.0 9.0 31.9 5.6 26.8 5.6	S G1A M1B15 AS O2 M2OB15 O2		Step to ladder Grasp side Lift off floor Arise Regrasp side Turn ladder vertical Regrasp side
									Release		M2OB15 RL1	26.8 5.6	M2OB15 O2		
									Reach to back of ladder		M12B	12.9			
									Grasp back		G1A	2.0			
									Pull out back		M2OB10	24.1			
									Release		RL1	2.0			
									Reach to back		R2OB	40.7	S815C2		Side step for balance
									Grasp back		G1A	18.6			
									Pull out to limit		M2OB10	24.1			
									Release		RL1	2.0			
									Reach to braces	2	R2OB	37.2			
									Grasp braces	2	G1A	4.0			
									Pull down braces	2	M12B	26.8			
									Press braces in place	2	AP1	32.4			
									Release	2	RL1	4.0			
									Reach to shelf		R24B	21.5			
									Grasp shelf		G1A	2.0			
									Pull shelf down		M1OB	12.2			
									Pull tight		AP1	16.2			
									Release		RL1	2.0			
									Drop hand to side		R36B	26.5	R15B		Release Drop hand to side
									Reach to shelf		R24B	21.5	R16B		Reach to front of ladder
									Grasp shelf		G5	2.0	G1A		Grasp side
									Push shelf up		(AP1)	16.2			
									Release		(M2B)	10.6			
									Reach to braces	2	R2OB	37.2			
									Grasp braces	2	G5	4.0			
									Apply pressure	2	AP1	32.4			
									Push up	2	M1OB	24.4			
									Release	2	R12	4.0			
									Reach to back		R18B	17.2			
									Grasp		G1A	2.0			
									Fold toward front		M2OB10	24.1	S815C2		Side step for balance
									Regrasp		O2	40.7			
									Fold shut		M2OB10	24.1			
									Release		RL1	2.0			
									Reach to top of ladder		R2OB	18.6			
									Grasp		G1A	2.0	M2OB10		Turn down
									Turn down		M2OB10	24.1			
									Release		RL1	2.0	M1OB15		Lower to floor
												19.9	S)		
												29.0			

SUB- STUDY NO.	DETAILED OBSERVATION DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RN	NO.	DESCRIPTION - RIGHT HAND
1637	(continued)											11.5 2.0 80.4 33.6 16.2 169.4	M10B G1A M12B Q2 AP1	6 6	To handle Handle Move handle in 1/2 rev. motions
1638	Wet mop floor - any type (100 sq. ft.) 32 sq. mop								Hold mop by handle			102.0 26.9 10.6 12.9 5.6 16.0 80.8 16.0 129.6 260.8	W6F0 M20B15 DE TBC1 DE Q2 RL1 R0B G1A AP1 M12B15 BSC1 Q2 BSC1 TBC1		Hold mop by handle Walk with mop Lay mop on floor, Flat side down Get in position to mop Get new hold on Mop about 15" Down from mop handle
									Regrasp near end of handle	8 8 8 8 8 8 8 8		44.8 136.0 148.8	Q2 BSC1 TBC1		Swing mop in strokes of about 6 or 7 ft. Regrasp mop handle Continue mop stroke Reverse direction of mop Step back
												990.8	M2F	8	
1639	Vacuum debris container, unhook from sweeper frame.	.0006	.0080	.0250	3	.0083	1.0	.0083							
1640	Vacuum debris container fasten to frame.	.0099	.0095	.0292	3	.0097	1.1	.0107							
1641	Vacuum debris container lift out, empty on floor and replace.	.0275	.0250	.0779	3	.0250	1.0	.0260							
1642	Pick up debris with shovel and broom, dispose in barrel.	.0550	.0510	.1575	3	.0525	1.0	.0525							
1643	Shovel and broom, obtain and replace.	.0545	.0265	.1285	4	.0321	.9	.0289							
1644	Machine sweep aisles in- cluding right and left turns into other aisles, per 4,000 square feet.	.1321	.1316	.3961	3	.1320	1.0	.1320							
1645	Debris, sweep into aisles from under storage areas fencing. Operator dis- mounts.	.0268	.0170	.0858	4	.0215	.85	.0183							

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TBW	RH	NO.	DESCRIPTION - RIGHT HAND
1646	Move aside small item of office furniture (2 ft.)								Reach for furniture item		R20B	15.6			
									Grasp		G1A	2.0			
												34.1	BSC2		Sidestep
												17.0	W12P		Move furniture item
												15.0	W1FO		Move furniture item
												2.0	W1P		Return
												66.7			
1647	Pick up sweepings and dispose											180.0	W12P		To dust pan or shovel
												15.8	R16B		Grasp handle
												2.0	G1A		Off floor
												5.7	W12FO		To pile of sweepings
									To handle of broom		R12B	204.0			
												2.0			
												67.0			
									Broom	3	OR	36.6	R10B	3	Stop to pile of sweepings
												15.8	OR	3	Dust pan to sweepings
												95.7	AS	3	Dust pan
												78.9	R10B	3	Arise from stoop
												19.5	R10B	3	Dust pan to container
												78.9	R10B	3	Empty dust pan
												14.6	R10B	3	Forward floor
												2.0	R10B	3	Turn scoop of pan
												9.3	R11		
												636.0			Release dust pan
															Hand aside
1648	Vacuum rug, move 3 chairs, per 100 square feet.	.0500	.0150	.1140	6	.0190	1.0	.0190							
1649	Vacuum rug, move 6 chairs, per 100 square feet.	.0400	.0250	.1200	4	.0500	1.0	.0500							
1650	Vacuum rug, move 10 chairs, per 100 square feet.	.0533	.0484	.3420	6	.0570	.8	.0456							
1651	Waste, Obtain Paper to Wrap											15.6	TBC1		Turn
												45.0	W1P		To newspaper
									To cut edge of paper		R15B	15.1			
									Edge		G1B	3.5			
									Pass to front of body		R15A	15.2	R20A		To newspaper
												3.5	G1B		Grasp cut edge
									Unfold to 14-5/8" x 23-1/2"		R15B	17.0	R15B		Unfold to 14-5/8" x 23-1/2"
												2.0	R11		Let go
												15.8	R16B		Reach to top edge
												3.5	G1B		Grasp
									Release		R11	2.0			

ELE. ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMV	RM	NO.	DESCRIPTION - RIGHT HAND
1654	(continued)								Grasp	mR22B O1A		17.3 2.0 2.0 8.0	W1P R11 O1A M4C		Walk to vacuum Release Grasp spring ring Move ring to hook on handle
									Release bag			5.6	P18R		Hook ring
									Hold head of vacuum	R11 O5		29.0 12.9 2.0 6.7	KOK R11 R12B O1A MJC		Kneel to attach Bottom of dust bag Reach to flange Get hold of flange Move bottom of flange to vacuum socket
												9.1	P18R		Insert flange into socket
												2.0	M2A		Secure top of flange to vacuum head
												0	O5		Put thumb on clasp
												10.6	AP2		Lock clasp
									Let go head of vacuum	R12P		31.9	M4A AKOK R12		Stand up Release
												137.7			
												18.6	TBC1		Turn to wrap waste
												15.0	W1P		Walk to newspaper
									Reach for left edge of paper	R11B		29.0	KOK		Kneel to wrap
												17.2	R18B		Reach for right edge of paper
									Pick up left edge			3.5	O1B		Pick up right edge
									Fold paper in	O1B		18.2	M2OB		Fold paper in
									Regrasp	M2OB O2		3.5 18.2 5.6 23.0	R11 R1OB		Release
												7.0	O1B	2	Reach to top/bottom of paper
									Regrasp	O2		26.8	M12B	2	Pick up edge
												11.2	R11	2	Fold in
												10.1	M8B	2	Let go
									Release	R11		2.0	O1A		Reach for wrapped package
												31.9	AKOK		Grasp
												18.6	TBC1		Stand up
												259.4			Turn
1656	Waste, dispose of								Reach to hinged cover	mR17B		180.0	W12P		Walk to dust bin
									Push cover open	M8B		18.6 10.6 12.8	TBC1		Turn
												2.0	mR12B5		Insert package
									Release cover			11.8	R11		Release package
									Hand away	R11 R12P		18.6	R12P		Hand away
												180.0	TBC1		Turn
												434.4	W12P		Walk back to work area

ELEM. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TBU	RN	NO.	DESCRIPTION - RIGHT HAND
2055	Excavate earth (average depth 9") using grader, bulldozer and front end loader per 1350 cu. ft.	1.5983	1.3774	29.2516	20	1.4626	1.11	1.6235							
2056	Load earth into truck with front end loader per 1350 cu. ft.	1.2764	.9968	21.9447	20	1.0972	1.11	1.2179							
2057	Roll earth with 3-wheel roller per 1800 sq. ft.	.2597	.2289	4.7520	20	.2376	1.06	.2518							
2058	Equipment, adjustments or minor repairs to, per 1350 cu. ft.	.1041	.0904	1.9054	20	.0952	1.00	.0952							
2059	Equipment, fueling and servicing per 1350 cu. ft.	.1286	.1189	2.5390	20	.1269	1.00	.1269							
2060	Open or close pipe wrench								Reach to screw		RAA	5.6	G2		Regrasp wrench handle
									Grasp screw with thumb	8	G1A	6.1			
									Turn screw	8	WFB	16.0			
									Release screw	8	RLA	16.0			
									Reach back to screw	7	RFA	16.0			
												34.0			
												73.7			
2061	Preliminary tighten or loosen with pipe wrench								Grasp pipe or vice		G1A	2.0			
												127.2	AP2	12	Pull wrench handle
												146.4	M10B	12	down to turn 3 threads
												67.2	G2	12	Return to starting point
												146.4	M10B	12	
												489.2			
2062	Wrench, adjust, monkey or crescent U-BT1MA01											11.2	G2	2	Regrasp wrench at neck
												10.0	R1A	4	Reach to screw
												0.0	G3	4	Contact screw
												11.6	M1B	4	Move adjustment
												0.0	RL2	4	Release screw
												13.5	M10C		Move wrench to work
												19.7	P228E		Try wrench on work
												5.0	R1A	2	
												0.0	G3	2	Make final screw adjustment
												5.8	M1B	2	
												0.0	RL2	2	
												76.8			
2063	Final tighten or loosen with wrench											48.6	AP1	3	Start last 3 motions
												6.0	WFB	3	Tighten
												32.4	AP1	2	Final tighten
												87.0			
2064	Remove wrench from work and set aside								Release pipe		RL1	2.0			
									Reach to head of wrench		R6B	8.6			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	MO.	LM	TIME	RM	NO.	DESCRIPTION - RIGHT HAND
2064	(continued)								Grasp wrench		G1A	2.0			
									Lift wrench		M10B	12.2	M10B		Lift wrench handle
									Release		R11	18.6	TBC1		Return to bench
												30.0	W2P		
												12.2	M10B		Set wrench down
												2.0	R11		
												87.6			
2065	Wipe excess dope from joint or fitting											18.6	R20B		Obtain wipe cloth
												2.0	G1A		From rear pocket
												4.0	D1E		
									Reach to pipe		M10B	27.3	W2EC		Move cloth to pipe
									Grasp		G1A	5.6	F1BSE		Position on pipe
												36.8	W2B		Wipe dope from threads
									Release grasp		R11	11.2	G2		
												2.0			
												5.6	G2		Regrasp cloth
												21.8	W2EC		Move to pocket
												10.6	AP2		Push into pocket
												2.0	R11		Release
												167.3			
2066	Tighten nut with adjustable open end wrench											5.6	G2		Regrasp wrench handle
												61.0	M10B		Move handle down
												16.0	D1E		Wrench off nut
												54.0	M10C		Lift wrench
												36.4	F1BSE		Reposition wrench
												48.6	AP1		Full tight
												221.6			
2067	Obtain pipe, position and engage threads											18.6	TBC1		
												15.0	W1P		Move to pipe
												29.0	B		
									Reach to pipe		R10B	11.5	R10B		Reach to pipe
									Grasp		G1A	2.0	G1A		Grasp
									Lift pipe		M10B10	13.9	M10B10		Lift pipe
												31.9	AB		
												18.6	TBC1		Return to work
												15.0	W1P		
									Assisting motions		M10C10	18.9	M10C10		Move pipe to position
												21.8	F2BD		Position end
									Regrasp pipe		G2	5.6	G2		Regrasp pipe
									Position pipe		F2BD	21.8	F2BD		Position pipe to threads
									Assisting motions		M10B10	21.3	M10B10		
												16.8	G2		Engage threads
												2.0	R11		
												263.7			
2068	Align rear end of long pipe (over 4' in length)								Regrasp held pipe		G2	5.6	G2		Regrasp held pipe
												20.0	ET		Look at rear end
												17.2	W2C20		Lift or lower end
												16.2	F2SE		Align
												7.3	W		Check alignment
												66.3			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALVE OBSERVED	LOW VALVE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO	DESCRIPTION - RIGHT HAND
2145	Tighten large fitting or flange by hand								Assisting motions	14	R8A	110.6	R8A	14	Tighten fitting or flange by hand
										14	G1A	28.0	G1A	14	
										14	M8B5	187.6	M8B5	14	
										14	RL1	28.0	RL1	14	
												354.2			
2146	Remove large pipe or pin wrench from work and set aside								Reach to head of wrench		R12B	12.9	G2		Regrasp handle
											G1A	2.0			Lift handle
									Lift wrench		M12B10	17.4	M10B10		
									Remove wrench		D2E	15.8			Remove wrench
												7.5	D2E		
												18.6	TBC1		
												30.0	W2P		Turn and walk
												29.0	S		
									Move to bench		M20B10	24.1	M20B10		Move wrench aside
									Release		RL1	2.0	RL1		Release
												31.9	AB		Arise
												194.2			
2147	Fill tank/per gallon	.0029	.0024	.0216	8	.0027	1.0	.0027							
2148	Drain tank/per gallon	.0055	.0045	.0391	8	.0049	1.0	.0049							
2149	Clean bell cover	.0210	.0115	.0755	5	.0151	1.0	.0151							
2150	Unwind and rewind water hose or electric cord from hydraulic motor carrier	.0285	.0255	.0540	2	.0270	1.0	.0270							
2151	Cork hydrant outlet with hammer and chisel	.0460	.0395	.1255	3	.0418	1.0	.0418							
2152	Climbing in and out of trap door opening from and to ladder								Edge of opening		G1A	12.9	R12B		For support
												2.0	G1A		Edge of opening
												14.3	LM12		Raise foot to edge
												2.0	RL1		Edge
												21.5	R24B		For support
												2.0	G1A		Edge of opening
									Raise foot to edge		LM12	14.3			
									Step up from rung		W2P	31.9	AB		Arise
									Climb down thru ceiling opening				RL1		
									For support		R8B	29.0	S		Stoop down
												11.5	R10B		For support
												2.0	G1A		Edge of opening
									For support		R2B	4.0			
									Edge of opening		G1A	2.0			
									Regrasp		G2	5.6	G2		Regrasp
												2.0	RL1		Release
												12.9	R12B		For support
												2.0	G1A		Grasp
									Release		RL1	2.0			
									For support		R12B	12.9			
												2.0			
												16.2	AP1		

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LM	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2388	Turn switch on or off											34.1 29.0 8.7 2.0 16.2 4.9 2.0 31.9 128.8	SS12C2 B R10A G1A AP1 M3A RL1 AB		Step to switch Bend Reach to handle Grasp Pull switch down or up Release Straighten up
2389	Turn light on or off											17.0 25.8 2.0 10.6 5.4 2.0 22.9 17.0 102.7	W1FO R30B G1A AP2 T90B RL1 R30E W1FO		To light To switch Turn switch Lower hand
2390	Start gas trimmer											14.6 0 2.9 0 17.2 4.0 16.0 11.2 83.0 12.8 4.0 86.0 8.6 0 2.9 0 262.8	M14B G5 M1A RL2 R6B G1A M4C P13E RL1 R6B G5 M1A RL2		Rope to starter Rope Rope around crank To wood handle Pull rope starter
2391	Turn off gas trimmer											13.6 8.4 5.6 0 10.6 0 38.2	R15E R4C P13E G5 AP2 RL2		To button To button To button Unramp button Grasp button Release button
2392	Start generator											45.0 28.7 29.0 7.8 2.0 2.0 8.6 2.0	W3P LM24 B R5B G1A M2B RL1 R6B G1A		Brace self To choke To knob of rope starter Starter

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL - 90% FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
2392	(continued)											102.6 145.8 2.0 12.9 2.0 2.0 2.0 31.9 426.3	M3B M30B RL1 R12B G1A M7A RL1 AB	18 6	Engage starter Start generator Starter To choke Choke
2393	Turn off generator											45.0 29.0 8.0 5.6 0 10.6 0 31.9 130.1	M3P B M6C P18E O5 AP2 RL AB		To button To button Button To button Button Button
2394	Tool, start (drill or similar w/trigger switch) U-MACTS01											6.1 0.0 16.2 0.0 22.3	R4C O5 AFB RL2		To start switch Start switch Start switch Start switch
2395	Turn on and off buffing machine								Move to "On" position Move to "Off" position	AP1 M2B RL2 M2B RL2		16.2 2.9 - 2.9 22.0			
2396	Turn switch off or on - branch lighting circuit											18.6 3.5 16.2 15.8 2.0 16.7 15.2 21.9 17.2 - 2.9 - 15.8 - 15.8 16.2 0 177.8	M20B G1B AP1 M16B RL1 M20E ET EF M18B O5 M2B RL2 M16B O5 M16B AP1 RL2	18 18 3	To panel door latch Pull Open door Drop arm Locate switch Turn on or off To door Close door

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALVE OBSERVED	LOW VALVE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF C.O.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TRU	RH	NO.	DESCRIPTION - RIGHT HAND
2397	Start and turn off electric trimmer											6.4 3 5.6 10.6 0 22.6 22.6 45.2	R4C Q5 F15E AP2 RL2		To starter switch Starter switch Starter switch Starter switch Start Turn off
2398	Turn on and light gas								Reach to lighter Grasp lighter Move lighter to burner Light gas Lighter aside Release lighter Reach away	R18B Q1A M12B AP2 M18B Q1A R10E	17.2 21.5 13.4 10.6 3.5 17.0 19.2 15.5 117.9	R24B Q1A AP2 T47B Q1D R24E		Reach to valve Turn on gas Remove hand	
2400	Open or close oil valve											25.8 2.0 16.2 3.6 2.0 22.9 72.5	R30B Q1A AP1 M2A RL1 R30E		Reach to oil valve Grasp handle Press to open Turn valve Release Return to position
2401	Open or close ram jack release valve								To pump housing Housing	Q10B Q1A	29.0 12.9 3.5 16.2 41.4 18.0 32.0 16.0 31.9 200.9	B R12B Q1B AP1 M2B RL1 R2A Q1A AB		To valve nut Nut Loosen or tighten nut Turn nut 1/3 turn Nut To new location Nut	
2402	Turn coolant on and off											26.2 4.0 9.2 4.0 8.0 4.0 9.2	R20A Q1A M2B RL1 R2B Q1A M2B	2 2 2 2 2 2 2	Reach to valve Grasp Turn valve Release Reach hand to get New grasp Turn valve

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ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RN	RF	DESCRIPTION - RIGHT HAND
2571	(continued)								Assisting motions	D2D M20C		10.1 11.8 22.1 29.0	R6D D2D M20C B		Reach to bottom of die Remove die from spud Lift die out carefully Bend
									Assisting motions	M14C P2ESD		16.9 25.3 16.2 8.1 2.0	M14C P2ESD AF1 M5A RL1		Move under machine Position die in slot Close die assembly
									Release	RL1		186.4			Release
2572	Remove and lay aside parts per piece			.0005	1	.0005	1	.0005							
2573	Remove circle attachments and lay aside								Same as right hand	R12B G1A M3B10 D3D		12.9 2.0 10.2 34.7 18.6 51.0 29.5 2.0	R12B G1A M3B10 D3D TBC1 W3FO M3B10 RL1		Attachment Side of machine Attachment
2574	Remove die from machine								Reach die	R14B		12.9	R12B		Reach bolt
									Grasp die	G5		4.0	G1A	2	Grasp bolt
												4.0	MFB	2	
												4.0	RFB	2	Unscrew bolt
												4.0	RL1	2	Release bolt
												5.3	R3B		Reach die
												7.3	G1C1		Grasp die
									Reach die	R14B		14.4	G1C1		Move die up
									Grasp die	G5		.0			
												5.6	G2		Regrasp die
												2.9	M1B		Move die out
									Move die aside	M12B		13.4	RL1		Release die
									Release die	RL1		11.8	R12E		Reach aside
									Reach aside	R12E		11.8			
												101.4			
2575	Remove punch from machine								Reach punch	R18B		17.2	R18B		Reach nut
									Grasp punch	G1A		2.0			
												4.0	G1A	2	Grasp nut
												4.0	MFB	2	Unscrew nut
												4.0	RFB	2	
												4.0	RL1	2	Release nut
									Move punch aside	M12B		15.5	R18E		Reach aside
									Release punch	RL1		2.0			
									Reach aside	R12E		11.8			
												64.5			
2576	Remove and replace shield from notch cutter											11.5	R10B		Reach to shield
												2.0	G1A		Lift up
												6.9	M4B		

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
2578	(continued)								Position belt		PLSSD	14.7	PLSSD		Position belt
									Regrasp belt		G2	5.6	G2		Regrasp belt
									Move belt on rollers	3	M2B	13.8	M2B	3	Move belt on rollers
									Release belt		RL1	2.0	RL1		Release belt
									Move hand to machine		R6B	8.6	R6B		Move hand to belt release
												2.0	G1A		Grasp handle
												16.2	AP1		Apply pressure
												6.1	M4A		Move handle
												2.0	RL1		Release handle
									Same as RH		R10B	11.5	M20B		Move hand to machine
									Same as RH		G1A	2.0	G1A		Grasp machine
									Same as RH		M2B10	15.7	M2B10		Turn machine upright
												13.4	M2B5		Tilt front of machine up
									Apply pressure on switch		G1A	2.0			
											AP1	16.2			
												2.0	RL1		Release front of machine
												8.6	R6B		Move hand to adjustment nut
												8.0	G1A	4	Grasp nut
												8.0	M7B	4	Move nut to adjust
												8.0	RL1	4	Release nut
									Release switch		RL1	10.0	RL1	4	Reach for nut
												8.6	R6B		Move hand to front of machine
												11.2	M2B		Set front of machine on bench
									Release machine		RL1	2.0	RL1		Release machine
									Move hand back		RL1E	13.0	RL1E		Move hand back
2580	Visual inspect part (small)											390.0			
												146.0	EF	20	6 sides to part
												12.0	RL1	6	
												24.0	R2B	6	
												12.0	G1A	6	
										3	M2B	27.6	M2B	6	
										6	RL1	12.0			
										6	R2B	24.0			
										6	G1A	12.0			
										3	M2B	13.8			
												283.4			
2581	Visual inspect part (medium)											175.2	EF	24	6 sides
												12.0	RL1	6	Part
												46.8	R5B	6	To part
												12.0	G1A	6	Part
										6	M5B10	76.8	M5B10	6	
										6	RL1	12.0			
										6	R5B	46.8			
										6	G1A	12.0			
												12.0	RL1	6	

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	RD.	LN	TIME	RH	NO.	DESCRIPTION - RIGHT HAND
2581	(continued)											46.8 12.0 404.4	R5B G1A	6 6	
2582	Visual inspect part (large)										M10B40	31.9 183.0 219.0 24.0 138.0 24.0	M10B40 ET4/10 EF RL1 R10B G1A	30 30 12 12 12 12	Move into position 6 sides
										12	RL1	24.0			
										12	R10B	138.0			
										12	G1A	24.0			
										8	M10B40	272.2 1061.1	M10B40	8	
2584	Visually check run out of cutter											29.0 146.0 31.9 206.9	B EF AB	20	Bend to level of cutter Visual check Stand up
2585	Gauge (thread), read 60X-MITUTO1											10.6 2.8 4.0 30.4 14.6 30.4 14.6 10.6 118.0	M5B T30PS MTC ET6/12 EF ET6/12 EF M5B	2 2 4 2 4 2	Move gauge to eye focus To light To adjust focus To read Reading Repeat to recheck Reading To balance
2586	Glass (magnifying), focus over vernier for reading 60X-MITUTO1											15.2 5.6 10.2 32.4	M12C G2 M1C P2SE	3 2	Move glass to vernier Regrasp glass Bring into focus Position for best visibility
												5.6 13.4	G2 M12B		Read vernier Regrasp glass Move to balance position
												82.4			
2587	Read indicator											29.0 29.2 31.9 90.1	B EF AB	4	Bend to dial Read Arise
2588	Micrometer, use, read scale to .001 U-BITMU02											5.7 7.3 12.2 29.2 12.2 29.2	ET6/16 EF ET4/10 EF ET4/10 EF	1 1 2 4 2 4	To mic Look at mic Locate mark Look at mark Locate .1 scale Look at mark and .1 scale

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THW	RH	NO.	DESCRIPTION - RIGHT HAND
2508	(continued)											12.2 29.2 12.2 29.2 73.0	ET ⁴ /10 EF ET ⁴ /10 EF EF	2 4 2 4 10	Locate .025 scale Look .025 scales To .001 thimble Look at .001 reading Note scale and thimble readings
2509	Micrometer, use, read scale, vernier bevel pro- tractor U-BITM001											231.0 5.7 18.6 24.3 116.8 24.3 116.8 24.3 116.8 24.3 116.8	ET ⁴ /10 EF ET ² /10 EF ET ² /10 EF ET ² /10 EF ET ² /10 EF EF	2 2 8 16 8 16 8 16 8 16 16	To protractor Look at protractor Scan vernier Locate zero on vernier For alignment with dial Look at minute scale To dial Look at dial for degrees Note vernier and dial readings
2590	Read meter											360.4 40.0 21.2 61.9	EF ET ²⁰ /8 EF		
2591	Item, locate in column of 50 items U-BRDIL01											20.0 7.3 9.6 5.6 14.5 36.5 4.2 98.4	ET EF R12A F15E M1B EF EF EF		Select starting point Finger to page Slide finger down column Scan column Read item
2592	Locate part in equipment											20.0 146.0 122.0 318.0	ET ²⁰ /8 EF ET ¹⁰ /10 EF	20 10	To location To part To next part
2593	Check bend											28.1 21.0 18.6 12.2 69.9	M20C P200E EF M10B EF	2	Align square to bend Check angle Remove square
2594	Read dimension from blueprint											18.6 34.0 37.2 29.0 18.6 0	TBC1 W2FO TBC2 B R20B G5		To bench To blueprint Hold down edge

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TRV	RM	NO.	DESCRIPTION - RIGHT HAND
2594	(continued)								Hold down edge	R208 05		18.6 0 60.0 7.3 20.0	RT 12 12	3	Search for dimension Read Check placement of dimension Remove hand Return to shoe.
									Assisting motions	R12 R108		0 10.5 31.9 18.6 34.0 37.2 57.5	R12 R108 AB TBC1 WZFO TBC2		
2595	Visually inspect lock seam (per foot)											7.3 11.4 18.7	RT 12 16		Eye focus Eye travel per foot
2596	Check spackled work	Study made of 344 Sq.Ft. of spackle work checked Total time - .0588 hrs. .0588/344 =													
							1	.0008/Sq.Ft.							
2597	Inspect job of painting window (per window)	.0030	.0010	.0180	10	.0018	1	.0018							
2598	Check equipment tag											25.8 2.0 9.4 29.0 14.6 31.9 112.7	R308 G1A T1808 S RT R12 AB	2	To number tag Grasp tag Turn tag Bend to read Inspect Release tag Return body position
2599	Check die size											4.6 18.6 19.2	RT6/20 RT	2	Look for marking Read marking
2600	Inspect pipe assembly after installation											37.2 29.0 21.9 31.9 18.6 2.0 16.2 2.0 18.6 34.1 21.9 213.4	TBC2 S RT AB TBC1 BOC2 RT	3	Stoop to pipe assembly Sight along pipe Move to different position Look at assembly
									Reach to pipe Grasp Pull on assembly Release	R208 G1A AP1 W11					

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	SN	NO.	DESCRIPTION - RIGHT HAND
2601	Inspect work	.0160	.0040	.0945	12	.0079	1.06	.0084							
2602	Alignment, check with level U-BUMAC02											20.4 5.6 11.2 8.0 2.0 6.8 43.8 6.4 2.0 13.4 119.6	M18C F18E G2 M2B R11 R4E Z7 R4B G1A M12B	2 4 6	Place level and Adjust slightly Move hand aside Move level aside
2604	Alignment, check with straightedge U-BUMAC01											22.1 16.8 21.9 24.0 18.2 105.0	M20C F18E Z7 MAC M20B	3 3 3	Move straight edge to part Position on part Inspect visually Move to another location Move part
2605	Check motor bearings for noise while operating											14.6 5.6 29.0 6.7 5.6 416.6 14.6 5.6 6.7 416.6 31.0 953.3	M14B G2 S M3C F18E M14B G2 M3C AS		Move screwdriver to bearing Stoop Move ear to screwdriver Estimated listening time (15 seconds) Move opposite bearing Move ear to screwdriver Estimated listening time (15 seconds) Arise from stoop
2606	Check motor bearing for temperature while operating											21.5 0 0 8.9 8.9 0 10.6	R24B G5 R12 M5B M5B G5 AP2		Touch bearing housing with hand Approx. temperature Hold hand on bearing

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TRU	RW	NO.	DESCRIPTION - RIGHT HAND
2606	(continued)											0 21.5 71.4	RL2 R24B		
2607	Inspect by feel											18.6 30.0 29.0 18.6 0 44.2 0 11.5 31.9 30.0 18.6 232.4	TBC1 W2P B R20B G5 M20C RL2 R10B AB W2P TBC1	2 2 2	To part Slide hand along
2608	Page, find; in manual U-WRDPF01								Reach to book Grasp top edge Open cover Release Reach to page edges Position thumb Grasp Open book to approx. location Release pages Reach to upper corner of page Grasp page Turn page Release		R10A G1A M16B RL2 RL2C P2BSE G1B APA M12B RL2 RL2D G1B M12B RL2	8.7 2.0 15.8 0.0 14.2 21.0 3.3 10.6 13.4 0.0 56.8 14.0 53.6 0.0 213.6			Book in R.H.
2609	Check alignment with chalk											14.4 2.0 13.5 5.6 73.0 108.5	R14B G1A M10C P1BSE B7	10	To chalk Chalk to work Check mark
2610	Inspect, feel with fingers 6MX-MUTIF01											14.2 3.4 16.2 0.0 25.4 0.0 59.2	RL2D M1C P2BSE G5 M9C RL2	2	Reach to surface Contact surface with finger Move finger along surface
2611	Square, use, part on bench U-BMSU02											25.5 10.4 5.6	M24C P1BSE G2		Move square to job Position on job Regrasp

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART									
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TIME	RH	NO.	DESCRIPTION - RIGHT HAND			
2625	Material, fold 780-80MMF01								Reach to material Grasp material Move toward body Move corners together Regrasp 2nd corner Release Reach to folded edge Grasp		R12B O1B M12B M12B G2 RL1 R10B G1A M1B RL1	12.9 3.5 13.4 3.5 13.4 5.6 2.0 12.9 2.0 2.0 11.5 2.0 4.0 2.0 90.7	(R12B) O1B M12B G2 RL1 R12B G1A M1B RL1		Reach to material Grasp material Move corners together Release Reach to folded edge Grasp			
2626	Ride elevator one floor	.0132	.0075	.0722	7	.0103	1	.0103										
2627	Fork lift, move 20 feet	.0038	.0020	.0058	2	.0029	1	.0029										
2628	Fork lift, raise and lower 10 feet	.0130	.0105	.0460	4	.0115	1	.0115										
2629	Throw away accumulated clippings										(R14B)	21.5 .0 36.6 0 23.0 8.6 12.9 12.9 18.6 51.0 29.0 0 2.0 31.9 18.6 51.0 317.6	R24B G5 M10B RL2 R10B R6B G4C TBC1 W3PO B M4B RL1 AB TBC1 W3PO	3 3 3 2	To scrap area on table Brush scrap Together against other hand Gather together Grasp bunch of scrap Turn body 90° To scrap basket Release scrap Turn body 90° Return to work area			
2630	Take scrap paper to waste box								Scrap paper transferred from right hand	15	R10B O1B M10B M4B	29.0 52.5 268.0 103.5	S R10B G1B M20A	15 15	To scrap paper To scrap paper To left arm			
												30.0 172.5 31.9 74.4 690.0	RL1 R10B AB TBC2 W4B	15 15 2	To scrap paper To waste box			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ONE FACTOR	LEVEL TWO TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2680	(continued)											18.2 P1SE		2	Place on nut
												16.2 APB			Apply pressure
												4.0 MYB		2	Unscrew bolt
												2.0 MYC		1	Move wrench for new hold on bolt head
												12.2 M1OB			Return wrench to tray
												2.0 RLI			Release
												87.2	✓ 2 for loos		en & tighten = 174.4
2681	Screw (adjusting) (rusty), loosen or tighten with a screwdriver 639-BT1SL01									3	R4A	48.6 APB		3	Break screw
										3	G1A	13.8 M2B		3	
												6.0 RLI		3	Loosen screw
												12.0 R2B		3	
												6.0 G1A		3	
												86.4			
2682	Bolt, tighten or loosen with wrench 60X-MT1SL01											12.7 MYC			Move wrench and Position
												19.7 P2SE			
												32.4 AF1		2	Move bolt
												6.9 M4B			
												3.6 G2			Regrasp wrench
												6.9 M4B			Move bolt
												4.0 D1E			Remove wrench
												88.2			
2683	Place bolt in flange joint and tighten nut by hand											21.5 R24B			Reach to bolt
												2.0 G1A			Grasp
												25.5 M24C			Move to hole
												5.6 P1SE			Position in 1st flange
												10.6 AF2			Shove bolt thru
												6.7 MYC			Flange holes
												16.2 P2SE			Position in 2nd flange
												3.6 M2A			Move into place
												2.0 RLI			Release bolt
									Reach to nut		R24B	21.5			
									Grasp		G1A	2.0			
									Move to bolt		M24C	25.5			
									Position on bolt		P2SD	21.6	02		Regrasp flange
										20	M1B	58.0			
										20	RLI	40.0			
										20	R1A	50.0			
										20	G1A	40.0			
									Run nut on and tighten	3	AF1	48.6	RLA		Release flange
												401.1			
2684	Obtain or return cleaning brush and emery cloth from tool box											18.6 TBC1			Turn
												45.0 W3P			To tool box
												29.0 B			Bend to box
												15.6 R14D			Reach tool box latch
												2.0 G1A			Grasp latch
												16.2 AF1			To break loose
												8.9 MCB			Lift latch
												8.6 RCB			To lid
									Reach tool box		R14D				
											G5				

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2688	Position screw to junction box cover plate and start thread											5.6 6.7 5.6 8.0 6.0 6.0 6.0 2.0 <u>45.9</u>	G2 M3C P1SE MFB RL1 RFE G1A RL1	4 3 3 3	Screw Screw to hole Position Start screw with finger Turn screw to hold
2690	Install bolt or remove											5.6 13.4 21.8 10.3 11.2 27.6 33.6 2.0 <u>125.3</u>	G2 M12B P2SD M6C G2 M2B G2 RL1	2 6 6	Bolt to hole Control Start bolt
2691	Obtain nut from pocket and start											20.9 4.6 8.6 2.0 5.6 4.0 25.5 5.6 <u>76.8</u>	R23B M2B R6B G1A G2 D1E M24C P1SE		To pocket edge Open pocket To nuts From pocket To end of bolt
2692	Loosen nut (bolted siding)											11.5 2.0 20.4 27.3 8.7 48.6 26.7 17.2 2.0 <u>159.4</u>	R10B G1A M18C P1SSE M1B AP1 M6B M10B RL1	3 3 3 3 3 1	Reach for wrench Grasp wrench Move wrench to nut Position to nut Move wrench on nut Loosen nut Move to loosen nut Move wrench aside Release
2693	Tighten 1/4" nut								Time to tighten taken from T/8			15.8 5.2 5.6 60.0 <u>86.6</u>	M16B M2C G2		Move tightener to nut To nut Tightener
												34.3 <u>120.7</u>	(S312	G2	to next nut)

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Change 1, Jan. 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALVE OBSERVED	LOW VALVE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	SN	NO.	DESCRIPTION - RIGHT HAND
2694	Remove nut (hand)											18.6 4.0 32.4 46.0 40.0 18.2 159.2	R20B Q1A AP1 M2B R2A M20B	2 2 10 10	Reach for nut Grasp nut Loosen Turn nut Lay aside nut
2695	Thread nuts and tighten with wrench - two nuts			.0285	1	.0285	1	.0285							
2697	Tighten anchor bolts on motor											2.0 11.5 2.0 64.8 18.0 98.3	RL1 R10B Q1A AP1 M12B10		Loosen grasp Reach to end Tighten grasp Pressure to loosen or tighten Turn after loosening
2698	Conduit - engage threads											21.8 2.0 8.7 2.0 21.8 16.2 16.8 89.3	P2ED RL1 R10A Q1A P2ED M1B10 Q2		Position end Regrasp conduit Start threads Engage threads
2699	Thread conduit (5 full threads)											425.0 50.0 405.0 815.0 1715.0	M16B MCA AP1 M16B30	25 25 25 25	Handle back Set ratchet Thread 1/5 of rev. x 25 = 5 full threads
2700	Obtain solderless connector and remove nut (split bolt type)								To connector		R24C	22.5			
									Connector to R.H.		Q4B	9.1			
									To nut on connector		M30A	27.1			
									Turn to remove nut	12	Q1A	24.0			
									To nut	12	T120B	81.6			
										12	R2B	48.0			
										12	RL1	24.0			
												4.6	M2B		Split bolt away from nut
												252.1			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2736	Run off nut by hand											7.0 18.0 48.6 32.4 18.0 4.0 128.0	R6A G1A AP1 M2A RL1 R2B	9 3 9 9 1	To nut Turn nut off
2737	Obtain blind assembly from end of table											18.6 15.0 18.6 21.5 2.0 5.7 18.6 15.0 18.6 8.9 2.0 144.5	TBC1 W1P TBC1 R24B G1A M3B TBC1 W1P TBC1 M6B RL1		To end of table Left of operator To end of table To assembly Return with assembly Lay assembly in front of operator
2738	Move assembled blind to finish table								To blind Blind Off table		R16B G1A M10B	15.8 2.0 12.2 37.2 75.0 18.6 45.0 37.2 17.0 2.0 262.0	R16B G1A M10B TBC2 W5P TBC1 W3P TBC2 M18B RL1		To assembled blind Blind Off table Away from table To end of table Around corner To finish table To finish table To table On table
2739	Move assembled blind aside								To assembly Away from work area		R8B G1A M24B RL1	10.1 2.0 20.6 2.0 34.7	R8B G1A M24B		To assembly Away from work area
2740	Slate off drying rack to pile on rinse rack - per two slats								To slats To slats To pile On pile		R30B G2 M30C P15SE	25.8 2.0 5.7 5.6 30.7 9.1 9.1 2.0 115.8	R30B G1A D1D G2 M30C P15SE RL1		To two slats Slat To pile On pile To pile On pile
2741	Obtain slate from drying rack and stack on assembly table											37.2 60.0 18.6 135.0	TBC2 W4P TBC1 W5P		Along table Side of table Around end To drying rack

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2757	(continued)										M30B	--	M24B		Returns to cut-off saw
											M10B	750.0	W50P		Lays blades on
											RL1	12.2	M10B)		table
												2.0	RL1)		
												1685.0			
2758	Return dado blades from machine to saw room											750.0	W50P		To saw room
												9.6	R12A		
												2.0	G1A		
												5.4	T90S		Open door
												13.4	M12B		
												2.0	RL1		
												45.0	W3P		
												18.6	TBC1		To peg board
												86.0	R24B	4	To blades in L.H.
												14.0	G1B	4	
												122.8	M30C	4	Blade to peg
												22.4	P1SE	4	
												8.0	RL1	4	
												18.6	TBC1		From peg board
												750.0	W50P		Return to saw
												1867.8			
2759	Hand carry motor components approximately 15 ft. from work bench to cleaning booth, hydraulic press or test panel or return	.0125	.0055	.0285	3	.0095	1	.0095							
2760	Load or unload large power panel (over 40W) on or from hand truck (1 of 2 men)											37.2	TBC1	2	
												90.0	W3P	2	Walk to part
												29.0	S		
												2.0	G1A		
									Grasp under end		G1A	17.2	M5B20		Lift one end
											AP1	2.0			
											M30B20	16.2	AP1		Pull to lift
												37.0	M30B20		Lift panel board end
													AS		
												37.2	TBC1	2	
												90.0	W3P	2	
												37.0	M30B20		Lower panelboard ends
									Lower one end		M30B20	2.0	RL1		
												17.2			
												2.0			
												416.0			
2761	Lift panel board to bench											29.0	S		Stoop to pallet or trailer
									Grasp panel board		G1A	2.0	G1A		Grasp panel board
									Lift panel board		(M30B 20)	37.0	M30B20		Lift panel board
													AS		Arise
												18.6	TBC1		Turn body
												51.0	W3P0		Walk to bench

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO. FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THU	RN	NO.	DESCRIPTION - RIGHT HAND
2761	(continued)								Lay on bench - Release		M12B RL1	13.4 2.0 153.0	M12B RL1		Lay on bench Release
2762	Obtain 100# or less pay-out reel or place aside (1) of (2) required men										R12A M10B25	51.0 29.0 30.9	W3PO S R12A M10B25		To reel Lift reel to body for balance
											M10B25 RL1	31.9 18.6 51.0 30.9	AS TBC1 W3PO M10B25 RL1		Carry reel Lower reel
												31.9 18.6 293.0	AS TBC1		
2763	Carry rotor or armature to lathe, position in chuck, tighten	.0100	.0060	.0230	3	.0077	1	.0077							
2764	Raise and lower tool bag, equipment or material (average 30 ft.) 2 men								Reach to hand line	12	R10B G1A	154.8 12.0			
									Pull on hand line (Weight average 7 lbs.)	12	M30B7 RL1	168.0 12.0	R30B G1A M30B7 RL1	12 12 12	Reach to hand line Pull hand line
												12.0 358.8 x 2 717.6	men		
2765	Get hand truck and place components on truck	.0120	.0050	.0445	5	.0089	1	.0089							
2766	Pull hand truck with components approximately 15 ft. to spray booth	.0060	.0030	.0220	5	.0044	1	.0044							
2767	Place 100# or less coil of wire on pay out reel - (1) of (2) required men								Reach to coil		R10B G1A M10B25	18.6 102.0 29.0 11.5 2.0 24.7	TBC1 W6PO S R10B G1A M10B25		To coil Stoop Reach to coil
									Lift coil			31.9 102.0 29.0	AS W6PO S		Lift coil Arise To reel Bend
									Coil over reel		M10C25 F1SE	26.4 5.6	M10C25 F1SE		Coil over reel
									Lower coil on reel		M10C25 RL1	26.4 2.0 31.9 153.0	M10C25 RL1 AB		Lower coil on reel

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE ON SELECTED	LEVEL NO. FACTS	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THU	RN	NO.	DESCRIPTION - RIGHT HAND
2045	(continued)								Assisting motions		R123 O1A M30B R11	12.9 2.0 24.3 2.0 42.0	R123 O1A M30B R11		Reach to side of part Grasp and turn part over Remove hand
2046	Position piece in bench machine - loosen, tighten and remove								Move and position piece in machine		M10C F188E M10C F18E	16.6 2.0 17.9 13.7 9.1 13.5 5.6 30.6 2.0 12.9 2.0 2.0 12.9 2.0 17.9 2.0 12.2	R20B O1A 1C6		Reach to adjusting screw Grasp end of screw Turn screw to open
									Grasp piece Remove part from machine		O1A M10B	176.7			Turn to lighter wheels Release wheels Reach to crank Grasp crank Release crank Reach adjusting screw Grasp adjusting screw Open screw Release screw
2047	Pick up small part and move to assembly										R20B O1B M20B5	18.6 3.5 3.5 21.5 37.2 85.0 15.1 184.4	R20B O1B M20B5 TBC2 W5FO M10B5		Pick up part Move to assembly Place near assembly
2048	Pick up medium part and move to assembly										R20B O1B M20B20	20.6 18.6 3.5 3.5 29.6 37.2 85.0 29.6 227.6	SS10C1 R20B O1B M20B20 TBC2 W5FO M20B20		Pick up part Move to assembly Place near assembly
2049	Pick up large part and move to assembly (per man)										R20B O1B M20B20 M20B35	68.0 18.6 3.5 37.8 85.0 37.8 250.7	W4FO R20B O1B M20B35 W5FO M20B35		Walk to rack Pick up part Move to assembly Return from rack Place near assembly

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TBW	RN	NO.	DESCRIPTION - RIGHT HAND
2050	Turn large part and move to soldering position (per man)										M12B30	12.9 2.0 26.6 2.0 17.2 2.0 36.2 2.0 17.2 2.0 2.0 17.2 2.0 36.2 2.0 17.2 2.0 26.6 25.3 258.6	R12B G1A M12B30 R12B G1A M24B30 R12B G1A M24B30 R12B G1A M24B30 R12B G1A M24B30 R12B G1A M24B30 P25SD P25SD		Reach to part Turn part Turn on edge Lay part down Move to position Position part
2051	Turn small to medium part over								To part To part Turn part		R10B G1A M4B15 M4B15 M4B15 M4B15 R12B 76.0	17.2 2.0 13.7 13.7 13.7 13.7 2.0 76.0	R10B G1A M4B15 M4B15 M4B15 M4B15 R12B		To part To part Part up Turn part Part down
2052	Turn large part over (per man)								Part Part Part up Turn part Turn part Part down		R10B G1A M2B25 M2B25 M2B25 M2A25 R12B 110.8	17.2 2.0 22.7 22.7 22.7 21.5 2.0 110.8	R10B G1A M2B25 M2B25 M2B25 M2A25 R12B		To part To part Part up Turn part Turn part Part down
2053	Turn medium sheet or part over (per man)								To part To bench		R10B G1A M10B20 R12B R20B G1A M40B R12B 131.8	25.8 0 37.0 34.1 2.0 18.6 2.0 30.3 2.0 131.8	R30B G1A R30B20 S812C2 R12B R20B G1A M40B R12B		To part Contact grasp edge Slide to edge of table Step aside Regrasp sheet Turn sheet over Remove hand
2054	Pick up brick								Reach for brick Grasp brick		R16C G1A	37.2 17.0 2.0	TBC2		Turn to bricks

E.L. UNIT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	NO. OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LN	TBU	RN	NO.	DESCRIPTION - RIGHT HAND
2007	(continued)											31.9 104.0 299.2	AB WTP		To front of shaper
2008	Get tool from tool room											18.6 375.0 200.0 18.6 18.6 375.0 18.6 1024.4	TBC1 W25P WT TBC1 TBC1 W25P TBC1		To tool room Waiting time To machine
2009	Get wrench to change blades - return wrench											37.2 60.0 58.0 3.2 26.8 63.8 37.2 60.0 74.4 2.0 422.9	TBC1 W2P B G1B M12B AB TBC1 W2P TBC2 RL1	2 2 2 1 2 2 2 2 2	Turn body 45° To get wrench Under table saw Arise bend Turn body 90° Return to front of saw Release wrench
2090	Obtain 12 in. ft. pre-milled fascia strip								To strip		R12B G1A	68.0 29.0 2.0 31.0 74.4 102.0 307.3	W4P B AS TBC2 W6P0		To strip To work area
2091	Obtain bender or hickey from within normal work area and lay aside											18.6 45.0 29.0 2.0 5.6 10.6 12.4 2.0 15.4 31.9 18.6 45.0 18.6 45.0 29.0 15.4 2.0 10.6 2.0 31.9	TBC1 W3P B G1A G2 M0B M10B G1A M10B5 AB TBC1 W3P TBC1 W3P B M10B5 RL1 M0B RL1 AB		To tool nearby Handle Lift handle Hickey to body To work area To tool storage Hickey away from body Lower handle

ELE. NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	MO.	NO.	DESCRIPTION - RIGHT HAND
2091	(continued)											10.6 45.0 55.2	TBC1 W3P		To work area
2092	Obtain new bulb from carton and place old bulb in carton								Release changer New bulb in carton	RL1 01B		29.0 3.5	S		Stoop
									Remove new bulb from carton	AP2		2.0 10.6	G1A AP2		Grasp edge of carton with fingers and hold carton back
									Reach back to carton Carton to left hand	MTB D2E T180 G3		9.7 7.5 9.4 5.6 16.9 5.6	ML4C PISE		Move bad bulb to carton
									Release carton	RL1		16.2 11.1 2.0 31.9 161.0	AP1 MTC G2 RL2 AS		Arise from stoop
2093	Obtain conduit 1/2" to 2" - 35 lbs.											10.6 45.0 29.0 11.5 2.0 31.9 29.3 18.6 51.0 31.3 268.4	TBC1 W3P S R10B G1A AS M10B33 TBC1 W3PO M10C33		Walk to pipe Bend to floor Grasp Arise from bend
2094	Obtain rigid conduit (2 1/2" to 4") - 100# - (1) of (2) required men											10.6 45.0 29.0 11.5 2.0 34.3 11.2 31.9 57.4 18.6 51.0 11.2 57.4 36.5 415.6	TBC1 W3P S R10B G1A M10B34 G2 AS M10B34 TBC1 W3PO G2 M10B34 M10C34		Walk to conduit Bend To conduit Grasp conduit Conduit to body Regrasp conduit Arise Conduit to shoulder
2095	Get parts and tools from tool box			.0067	1	.0067	1	.0067							To work Off shoulder To locate

ELEM- ENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RN	NO.	DESCRIPTION - RIGHT HAND
2896	Obtain small part from floor (5 paces) (up to 2.5 lbs.)	7										18.6 75.0 29.0 2.0 31.9 18.6 75.0 250.1	TBC1 WSP S RICH GIA As TBC1 WSP		Turn Walk Stoop Reach Grasp part Arise from stoop Turn Walk
2897	Obtain screw and position to wire										RICD	12.9 2.0 13.5 16.2 2.0 46.6	RICD GIA KLOC P2SE RLI		To screw Screw to position Position screw
2899	Remove tester from container and return								Remove tester			15.8 6.0 4.4 4.0	RICH GIA	3	To handle
									To container	2	RICH GIA AP1	16.2 24.1 2.0 15.8 6.0 28.4 26.6 15.7 2.0 2.0 179.0	AP1 M2OB10 RLI RICH GIA M2OC10 P2SED M2OB10 RLI		Full out of container
									Return			15.8 6.0 28.4 26.6 15.7 2.0 2.0 179.0	RICH GIA M2OC10 P2SED M2OB10 RLI	3	To handle
									Release box		RLI	15.8 6.0 28.4 26.6 15.7 2.0 2.0 179.0	RICH GIA M2OC10 P2SED M2OB10 RLI		Tester to container Tester Move into place Release handle
2900	Remove new tube from carton in left hand											19.8 10.4 2.0 3.7 2.0 8.4 7.3 10.6 8.9 18.2 2.0 95.3	M2OD FINGER GIA M2B RLI RAD GIC1 AP2 M2B		Carton top Fingernail under lid Grasp top Pull up carton top Release To tube in box From box
									Discard carton		M2OB RLI	15.8 6.0 28.4 26.6 15.7 2.0 2.0 179.0	RICH GIA M2OC10 P2SED M2OB10 RLI		

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ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TRW	RN	RS	DESCRIPTION - RIGHT HAND
2901	Cloth, obtain or put away											25.8 2.0 24.3 32.1	R30B G1A R30B		Reach to cloth Grasp cloth Move cloth
2902	Raise part to wash from vat								To part in vat Pick up Control part Control part Raise to wash	2	R20 G1B M2B G5 M20B	19.8 3.5 4.0 5.6 18.2			
												11.5 18.2 5.6 10.6 5.6 18.2	R10B M20B G2 AP2 G2 M20B		To rag Rag to part Rag around part Rag around part Rag in hand Rag aside
									Get part Part to vat Rinse part		G2 R30B R11	5.6 24.3 2.0 132.7			
2903	Pick up small particle off floor								Reach for particle Grasp		RGB G1A	29.0 8.6 2.0 31.9 34.1 15.0 2.0 122.6	S AS SQC2 W1P.		Stoop Arise Sidestep
2904	Toilet tissue, obtain											45.0 27.2 2.0 21.8 37.2 133.2	W3P R32B G1A M20B TBC2		Walk to shelf Reach for roll Grasp roll To side Turn towards stall
2905	Towels, paper (2), obtain											21.5 2.0 13.4 12.9 2.0 13.4 45.2	R24B G1A M12B R12B G1A M12B		Reach for towel Grasp towel Pull towel Reach for second towel Grasp Pull towel
2906	Obtain block and sledge hammer											18.6 60.0 29.0 2.0 10.6 2.0	TBC1 W4P S G1A M2B		Walk to sledge hammer Bend Grasp handle Lift handle
									Grasp other end of handle Pull to lift		G1A AP2	10.6 31.9	AP2 AS		Pull to lift hammer Arise

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TIME	RH	NO.	DESCRIPTION - RIGHT HAND
2906	(continued)											45.0 29.0 2.0 31.9 105.0 18.6 29.0 19.7 16.2 2.0 31.9 495.0	W3P S G1A AS W7P TBC1 S P2SSE AP1 RL1 AS		Walk to block Stoop Grasp block Arise Walk to work Stoop Arise
2907	Pick up one additional bolt, nut, washer, clamp etc.								Reach to item in R.H. Transfer item to L.H.	R10A G3	8.7 5.6 12.9 21.9 32.0 4.0 12.2 97.3	G3 R10C G4A M5B RL1 M10B	3 4 2	Transfer item to L.H. Reach into bin Select Suitable Item Move out of bin or to L.H.	
2908	Pick up each clamp bolt, nut, washer etc.										12.9 21.9 32.0 4.0 12.2 83.0	R10C G4A M5B RL1 M10B	3 4 2	Reach into bin Select Suitable Item Move out of bin or to L.H.	
2909	Pick up one clamp, washer, bolt, nut, heel, jack, parallel, etc. from table										15.8 2.0 15.8 33.6	R16B G1A M16B		Reach to Pick up Move to balance	
2910	Pick up each additional clamp, bolt, washer, heel from table										5.6 6.4 2.0 14.0	G2 R4B G1A		Regrasp part in hand Reach to next part Pick up additional part	
2911	Pick up and lay aside file or stone										12.9 2.0 13.4 13.4 2.0 43.7	R12B G1A R12B R12B RL1		Reach to file or stone Pick up Move to work area Move file aside Release file	
2912	Get height gauge from case or return								Reach to lock Grasp lock with thumb Unlock	R16D P15E M1B	17.0 5.6 5.2 5.6 2.9	R14B P15E M2C P15E M1B		Reach to lock Grasp lock with thumb Unlock	

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2912	(continued)								Reach to lid of case	R4B		6.4			
									Grasp	G1B		3.5			
									Open case	M12B		13.4			
									Release	RL1		12.9	R12B		Reach to ht. gauge
												3.5	G1B		Grasp
												7.5	D2E		Pick up
												5.6	G2		Regrasp
												20.4	M18C		Move to bench
												5.6	F18E		Set on bench
												2.0	RL1		Release
									Reach to lid	R10B		11.5			
									Grasp	G1A		2.0			
									Close lid	M12B		13.4			
									Release	RL1		2.0			
												11.5	R10B		Reach to bore of gauge
												2.0	G1A		Grasp
												13.4	M12B		Bring to bal. position
												172.9			
2913	Pick up gauge from bench											19.8	R200		Reach to gauge
												3.5	G1B		Grasp
												15.8	M16B		Move to balance
												39.1			
2914	Vernier, remove and replace in case 6XX-MJFVR01								Reach to case	R18B		17.2	R18B		Reach to lock
									Grasp case	G1A		2.0	G5		Grasp lock
									Regrasp	G2		5.6	MFC		Slide to unlock
									Open case	M5B		8.0			
												12.2	R9D		Reach to vernier
												3.5	G1B		Grasp vernier
												4.0	D1E		Remove from case
									Close case	M5A		17.0	M18B		Bring to bal. position
									Release case	RL1		2.0			
									Reach to case	R18B		17.2			
									Grasp case	G1B		3.5			
									Open case	M5B		8.0			
												20.4	M18C		Move vernier to case
												21.0	P2N8E		Position vernier in case
												2.0	RL1		Release
												9.3	R8E		Move hand out of way
									Close case	M5B		8.0			
												10.1	R6D		Reach to lock
												0.0	G5		Contact grasp lock
									Release case	RL1		2.0	MFC		Slide to lock
												2.0	RL1		Release lock
												177.0			
2915	Assembly (indicator), remove from box 6XX-MJFAR01								Reach to box	R14B		15.6	R14D		Reach to box lid
									Grasp box	G1A		2.0	G5		Grasp box lid
									Hold box	AFB		16.2	AFB		Break loose box lid
												4.6	M2B		Move lid
												5.6	G2		Regrasp lid
												6.9	M5B		Move lid to end of box
												7.5	D2E		Move lid from box
												7.2	M5B		Lay lid aside

ELE. NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2915	(continued)											2.0 12.9 3.5 2.9 5.6 12.2 8.9 113.6	RL1 R100 G1B M1B J2 M10B RL1		Release lid Reach to indicator Grasp indicator Move indicator Regrasp indicator Lay indicator aside Release indicator
2917	Obtain lawnmower and bring to bench								Regrasp box Raise box from cabinet	03 1.5					
												29.0 12.9 2.0 31.9 19.4 17.2 2.0 34.1 30.0 37.2 12.9 2.0 18.2 2.0 250.8	B R12B G1A AB M22B RL1 G1A SS12C2 W2P TBC2 R12B G1A M20B RL1		Send and Reach to mower Grasp mower Arise and pull Handle up Release mower Body in position to push mower to bench Handle Set handle against bench Release
2918	Select and obtain stock from storage rack or bin. (Average length = 36")								To handle Grasp handle	R18B G1A					
									Set handle against bench Release	M20B RL1					
												80.0 29.2 29.0 2.0 32.4 49.3 15.6 2.0 40.3 38.0 14.6 335.6	RT46 /16 EF B M20B G1A AP1 M20B40 M20B TBC1 M20B40 SS100C AP RT20/ 16 EF	4 4 2 2 2 2	Select proper Material Send and reach to stock Stock Begin to slide stock from rack Move stock. If from rack-slide stock and step aside if from Bin-pick up Turn when stock is in rack Stock from rack Inspect stock
									Pick up stock - when stock is obtained from Bin only to stock when in rack	M20B G1A M20B40					
									Grasp stock Stock from rack						

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2921	Get one tool from tool box or case											20.0 14.6 12.9 9.1 17.0 2.0 75.6	ET 30/16 EF R12B G4B M18B RL1	2	To box Search Reach Pick up Lay aside
2922	Move tool from table of machine to work area								NOTE: can be accomplished with either hand Reach to tool Grasp tool Move tool to work area	R14B G1A M36B	14.4 2.0 27.9 44.3				
2923	Move tool from work area to table of machine								Move tool to table of machine Release tool Return hand to rest	M36B RL1 R14E	27.9 2.0 13.0 42.9				
2924	Obtain tool from cabinet under bench											29.0 18.4 7.3 17.0 31.9 103.6	3 R18C G4A M18B AS		Stoop to Reach into cabinet Pick up tool Move tool to balance
2925	Get and lay aside tool from bench											18.6 2.0 24.1 - 24.1 2.0 16.7 87.5	R20B G1A M20B10 - M20B10 RL1 R20E		Reach to tool Grasp tool Move tool Adjust and use Lay aside

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TRV	BN	NO.	DESCRIPTION - RIGHT HAND
2908	Place tool in tool box or case											15.2	M12C		Move tool to drawer or case
												10.4	P1MHE		Position tool in drawer or case
												2.0	RL1		Release tool
												27.6			
2909	Return tool to cabinet under bench											29.0	S		Stoop to
												17.0	M12B		Move tool into cabinet
												2.0	RL1		Release tool
												15.5	R10E		Reach to balance
												31.9	AS		Stand up
												95.4			
2932	Get and lay aside electric power tool from bench											18.6	R20B		Reach to tool
												7.3	G1C1		Grasp
												5.6	G2		Regrasp
												29.6	M20B20		Move to work area
												-			Use
												29.6	M20B20		Move to bench
												2.0	RL1		
												16.7	R20E		Hand out of way
												109.4			
2933	Move hand tool to Part and away											-	-		Tool in hand
												25.9	M12C20		Move to hole
												21.8	F2B		Position in hole
												-	-		
												16.2	AP1		Lift
												11.8	D2D		
												13.4	M12B		Move out
												69.1			
2934	Position tool or part with care and position aside with care											16.2	F2B		To
												16.2	F2B		Aside
												32.4			
2935	Pick up and lay aside towel								Reach to towel	R20B		18.6			Hold cutter
									Pick up towel	G1A		2.0			
									Move towel to balance	M20B		18.2			
									Regrasp towel	G2		5.6			
									Move towel aside	M20B		18.2			
									Release towel	RL1		2.0			
												64.6			
2936	Obtain and place knee boards											21.9	S		Stand
												11.5	R10B		To pick up knee boards
												5.6	G1A		Grasp knee boards
									To pick up trowel	R10B		11.5			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OF SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	CS.	LN	TBU	RN	NO.	DESCRIPTION - RIGHT HAND
2936	(continued)								Grasp trowel		G1A	5.6			
									Pick up trowel		M20B	31.9	AB		Arise
												45.0	M3P		Pick up knee boards
												21.9	B		Walk out on concrete
												18.2	M20B		Bend
												18.2	M20B		Place knee board on
												4.0	R11	2	concrete, place 2nd
												15.0	M1P		on concrete
												69.4	K2K		Step on back board
												5.6	O3		Kneel both knees
															Transfer trowel to
									Transfer trowel to		O3	76.7	AXBK		right hand
									left hand			5.6			Arise
												18.6	R20B		Reach to knee board
												5.6	G1A		Grasp board
												12.2	M10B		Pick up 1 board
												14.8	T150M		Turn board
												24.3	M30B		Deposit 1 knee board
												9.4	T150B		
												11.5	R10B		Reach to board
												5.6	G1A		Grasp board
												24.3	M30B		Move 2nd board back
												5.6	R11		Release
												15.0	M1P		Step on back board
												514.5			
2937	Obtain fire brick								Hand to brick		R16B	29.0	B		To brick
									Grasp		R20B	24.4			Hammer in hand
									Regrasp		G1A	2.0			
											G2	5.6			
											M20B	31.9	AB		Arise
												92.9			
2938	Get and place measure of material											42.4	M2B	4	Dip container full
												35.6	M2B	4	Material off of sack
												82.4	M24B	4	Material to floor
												27.6	M3B	4	Dump material
												61.8	M24B	3	Container to sack
												24.0	MAC	3	Container into sack
												273.8			
2939	Pick up packing material											29.0	B		To floor
												17.2	R10B		To cardboard
												2.0	G1A		Grasp
												12.9	R12B		To second cardboard
												2.0	G1A		Grasp
									To packing material		R10A	13.4	R12B		To other hand
									Hold		O3	5.6			
												17.2	R10B		To steel bands
												2.0	G1A		Grasp
												12.9	R12B		To other bands
												2.0	G1A		Grasp

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	LC	LN	TBU	RH	NO.	DESCRIPTION - RIGHT HAND
2944	Obtain part from supply wagon or set aside after use											18.6 225.0 37.2 4.0 36.4 18.6 225.0 564.8	TBC1 W15P R20B G1A M20B TBC1 W15P	2 2 2 }	Turn body Walk to supply wagon Reach for part Grasp Move out of wagon Return to work area
2945	Get Hawk and scraper or lay aside											18.6 30.0 29.0 15.8 2.0 12.2 15.8 2.0 12.2 31.9 37.2 30.0 18.6 255.3	TBC1 W2P B R16B G1A M10B AB TBC2 W2P TBC1	1 1 1 }	Walk to hawk and scraper Bend Reach to scraper Grasp scraper Lift scraper Arise Turn Return
2946	Obtain gasket cutter case, open, close and return								Reach to hawk Grasp hawk Lift hawk	R16B G1A M10B		21.5 2.0 5.6 12.9 0.0 16.2 4.6 5.6 12.2 2.0 21.5 2.0 13.4 4.0 0.0 5.6 4.6 2.0 5.6 18.2 2.0 161.3	R24B G1A G2 R12B G3 AP1 M2B G2 M10B RL1 R24B G1A M12B R2B G3 P15K M2B RL1 G2 M20B RL1		Reach for case Grasp case Regrasp to open Release case Reach to latch Touch latch Press latch Open latch Regrasp lid Open lid Release lid Reach to lid Grasp lid Close lid Reach to latch with thumb Touch latch Position latch Close latch Release latch Regrasp case Move to set aside Release
2947	Obtain large hand cutter and position								Assisting motions	G1A AP2		18.6 45.0 29.0 7.3 10.6 31.9	TBC1 W3P B G4A AP2 AB	1 }	Walk to cutter Bend Grasp Pull Arise

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
2950	(continued)								Assisting motions	R20B O1A M20B20	18.6 2.0 29.6	R20B O1A M20B20			Reach to pipe Grasp Lift
											31.9 18.6 68.0 29.0 29.6 2.0	AS TBC1 W4FO S M20B20 RL1			Arise with pipe Walk back to hoist Move end to ground Release
									Set other end down	M20B20	29.6				
									Release	RL1	2.0				
											31.9 100.4	AS			Arise from stoop
2951	Pick up tubing										18.6 45.0 29.0	TBC1 W3F S			Turn and walk to tubing Bend
									To assist	R12B					to tubing
									Grasp	O1A	2.0	O1A			Grasp
									For control	O2	5.6	O2			For control
									Move to balance	M12B15	31.9	AS			Arise
											18.6 45.0 135.7	M12B15 TBC1 W3F			Move to balance Turn and walk back to bench
2952	Get wires										18.6 102.0 17.2 12.9 5.6	TBC1 W6FO R10B O4C O2			Turn Walk to wires Reach to wires Grasp several strands Regrasp to hold
									Reach under strands grasp and regrasp to hold	R12B O1A O2	12.9 2.0 5.6				
											24.0	W4C		3	Separate several strands
									Reach for new hold on selected strands	RL1 R6B O1A	2.0 8.6 2.0				
									Regrasp strands	O2	5.6	O2			Regrasp strands
									Pull strands out	M12B	13.4	M12B			Pull strands out
									Release hold	RL1	2.0				
									Reach for new hold	R12B	12.9				
									Grasp strands	O1A	2.0				
											18.6 102.0 17.0	TBC1 W6FO R10B			Turn Walk to pipes Lay wires down
									Lay wires down	M10B					
									Release hold	RL1	2.0				
											306.9				
2953	Obtain large pipe wrench and position on work										18.6 30.0 29.0 11.5	TBC1 W2F S R10B			Step to wrench Reach to handle

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
2953	(continued)								Reach to wrench head	R10B		2.0	G1A		Grasp
									Grasp	G1A		16.2	AP1		Press to lift
									Press to lift	AP1		15.7	MGB10		Lift handle
									Lift wrench	MGB10		11.5			
									Assisting motions	M20C10		2.0			
										P2SSD		16.2	MGB10		Lift wrench
												15.7	AS		Arise
												31.9	TBC1		Step to work
												18.6	W2P		
												30.0			
												28.4	M20C10		Move wrench to pipe
												25.3	P2SSD		Position on work
												20.1	M14B10		Lift handle to hold
												322.7			
2954	Obtain supply of stolons											150.0	W10P		To supply of stolons
												29.0	B		
												7.8	R5B		To box
												2.0	G1A		Pick up box
												31.9	AB		
												150.0	W10P		Back to furrow
												29.0	B		To ground
												10.7	M5B10		
												2.0	RL1		
												31.9	AB		
												444.3			
2956	Pick up bolt and nut											19.8	R20C		Reach to box
												9.1	G4B		Grasp bolt
												11.2	G2	2	Regrasp bolt in palm of hand
												14.2	R12C		Reach to other box
												9.1	G4B		Grasp nut
												3.6	G2		Regrasp nut in palm of hand
									Reach to right hand	R20A		13.1			
									Transfer bolt to hand	G3		3.6			
									Move bolt to assembly	M20B		16.2			
												105.9			
2957	Obtain and set aside flux jar (within reach)											21.5	R24B		To flux jar
												2.0	G1A		Grasp jar
												16.2	M20B		To work area
												2.0	N11		Release jar
												15.5	R10E		Remove band

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL AND FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TRV	RN	NO.	DESCRIPTION - RIGHT HAND
2957	(continued)											17.2 2.0 80.6 2.0 19.2 120.1	R108 G1A M248 AL1 R242		To flux jar Grasp jar Move aside Release jar Remove hand
2958	Obtain or return small to medium part										R168 G1A (M12815) AS M10815 RL1	85.0 29.0 15.8 2.0 31.9 18.6 85.0 25.5 2.0 294.8	W5FO S R168 G1A AS M12815 TBC1 W5FO M10815 RL1		To part Stoop to floor To part Stand Balance To layout table On table
2959	Obtain or return large part (per man)								On table		R128 G1A AS M10825 RL1	85.0 29.0 12.9 2.0 31.9 18.6 85.0 30.9 2.0 297.3	W5FO S R128 G1A AS M10825 RL1		To part Stoop to floor To part Stand Balance To layout table On table Release part
2960	Select template from rack											18.6 119.0 18.6 119.0 18.2 2.0 14.2 309.6	TBC1 W7FO TBC1 W7FO M208 RL1 R162		To template rack Lay template aside
2961	Pick up washer or rivet											18.6 9.1 20.6 48.3	R208 G1B M248 W2		To washer or rivet Select and grasp To work Regrasp around edges
2962	Anchor, get and place under rail 910-MONAG01								Let go end of anchor To other end of anchor Fingers on anchor		R128 G1A G2 M1285 RL1 R108 G2	29.0 12.9 2.0 5.6 16.4 2.0 11.5 5.6	S R128 G1A G2 M1285 RL1 G2		Stoop to rail Reach to anchor Pick up anchor Control anchor Move anchor to rail Fingers out of way

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ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
2965	(continued)								Release wire	24	(RL1)	86.4 20.4 9.1 6.1 2.0 15.5 2363.2 for 23 wires 94.5 per wire	M2A M10C P15SE M4A RL1 R10E	24	Spread handles to open Return pliers to pocket Position at pocket Move into pocket Release Hand back
2966	Handle (jack), pick up 910-MTLMPO1								Pick up handle Grip handle Lift handle		G1A APA M10B20	29.0 2.0 10.6 19.9 31.9 93.4	S AS		To ground Stand up
2967	Level, get from rail 910-MTLLQ01								Tie			29.0 10.1 2.0 5.6 17.0 31.9 95.6	S R0B G1A G2 M0C0 AS		Stoop To handle of level Pick up level Gain control Raise level with care Stand up
2968	Plate (tie), get and position on rail 910-M0MFG02								Pick up one end Assist Move to tie Place other end on tie Change hold		R12B G1B G2 M12B10 M0C10 P15E G2 APA RL1	29.0 12.9 3.5 5.6 18.8 15.3 5.6 15.3 5.6 10.6 2.0 129.8	S R12B G1B G2 M12B10 M0C10 P15E G2 APA RL1		Stoop Reach to tie plate Pick up Lift and move Place one end on tie Change hold Hold in place Release
2969	Plate (tie), get and place under rail 910-M0MFG01								Assist Let go end of plate To other end Fingers to plate		R12B G1A G2 M12B10 RL1 R10E G2 APA M10C10 RL2	29.0 12.9 2.0 5.6 18.8 2.0 14.4 5.6 16.2 26.5 0.0 31.9 164.3	S R12B G1A G2 M12B10 G2 G2 M10C10 RL2 AS		Stoop to rail To plate Pick up plate Gain control Plate to tie Fingers from under Push plate Align plate with rail Let go plate Arise from rail

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
2970	Tool, obtain from roadbed 910-BTL7001								Take			18.6 34.0 29.0 10.1 2.0 5.6 10.6 18.3 31.9 18.6 178.7	TPC1 WZPO S RDB G1A G2 APA MGB20 AS TBC1		Face tool Step to tool To roadbed Reach to tool Pick up tool Control tool Grip tool Raise tool Stand Face rail
2972	Spike, (3/16" x 6") Obtain (to 8) from carton											31.9 18.6 45.0 29.0 14.4 10.8 6.0 31.9 AS 18.6 45.0 29.0 280.2	AB TBC1 W3P S R14B G1C3 G2 M14E AS TBC1 W3P B	3	
2973	Obtain tag from pocket, and position to write								Reach to tag Grasp to hold Release hold		R12A G1A R12	25.8 3.5 5.6 5.7 24.3 9.6 2.0 29.0 9.6 3.5 31.9 150.5	R30B G1B G2 M3B M30B B R12A G1B AB		Reach to pocket Grasp tag Lift tag out Move to writing surface Bend to write Reach to filled out tag Grasp Arise
2974	Remove magnifying glass from shirt pocket											10.5 16.2 6.9 2.0 5.6 6.1 4.0 13.4 65.7	R14A F20E MAB G1A G2 MAA D1E M12B		Reach to pocket Position hand Move hand into pocket Grasp magnifying glass Regrasp Move glass out of pocket Move glass out of pocket Move to balance position

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ELEM- ENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RN	NO.	DESCRIPTION - RIGHT HAND
2975	Move sanding block from work											20.6 2.0 22.6	M24B RL1		Move from work Release
2976	Return measuring board										(R14B) O1A	85.0 20.1 2.0 74.4 68.0 37.2 2.0 288.7	W5PO R22B O1A TBC2 W4PO TBC2 RL1	2	To board To board Board Turn around To tool area
2977	Clear material from immediate work area (per door)			.0255	1	.0255	1	.0255							
2978	Lay bottom rail aside											12.9 2.0 19.4 8.6 2.0 44.9	R12B O1A SS16C1 M10B RL1		To bottom rail Side step to right Lay aside on table
2980	Lay work on bench holding flaps together										(M5A)	8.6 2.0 9.7 2.0 22.3	R6B O1A M5A RL1		Hand comes around and grasps work to lay down
2982	Template (wood), remove from top of stock 669-M10TR01								To template Hold template		R24B O1A	21.5 2.0 40.8 18.2 9.2 25.5 5.6 5.6 13.4 2.0	R24B O1A M10C P18SE M2B M24C O2 P18SE M12B RL1	2 2 2	For hammer To tack on template Align claw on hammer Pull tack up Hammer to strap
									For template		RL1 R24B O1A M24B RL1	2.0 25.8 2.0 24.3 2.0 197.9	R11 R30B O1A M30B RL1		Align hammer Onto strap For template Lay template aside
2983	Plate (cover), replace 74X-M11PR01											10.3 25.3 5.6 16.2 6.9 12.7 2.0 15.8 2.0	M6C P28CB O2 APB M4B M12B O1A M16B RL1		Screw driver to plate Position to edge Fry up plate Set screwdriver aside

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALVE OBSERVED	LOW VALVE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RH	NO.	DESCRIPTION - RIGHT HAND
2963	(continued)								Same as R.H. Same as R.H.		M16B RL1 M16B	15.8 2.0 15.8 2.0 15.8 3.5 2.9 5.6	R16B G1A M16B RL1 M16B G1B M1B G2		To plate Set plate aside To plate
									Same as R.H.		G1A M16C P2WED	5.6 18.7 26.6 2.0 207.7	M16C P2WED RL1		Put plate back
2966	Put screw in box								To R.H.		M10A	11.3 5.6 12.2 2.0 31.1	G10A G3 M10B RL1		To L.H. To box
2968	Obtain and put away part or tool (below knee level)											29.0 21.5 2.0 31.9 17.2 17.2 29.0 20.6 2.0	S R24B G1A AS M16B M16B S M24B RL1		To part Lift part Move part to ceiling Move part from ceiling With part To set part down

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ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL TIME FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RH	NO.	DESCRIPTION - RIGHT HAND
2994	(continued)								Tip barrel		M6B	11.5	R10B		Reach toward bottom edge
									To lift		AP1	2.0	G1A		Grasp bottom
									Lift barrel to lugger		M24A22	16.2	AP1		To lift
												37.7	M24A22		Lift barrel to lugger
													AR		Arise
												2.0	RL1		Release edge
												16.6	R20B		To center section
													G5		Hand on side
									Tap barrel against lugger	4	M6B8	25.4	M22B10		Tip barrel
												55.1	M6B8	4	Tap barrel against lugger
												26.8	M24B8		Lower container
													RL2		
												235.8			
2995	Move ash stand or waste basket aside and reposition								Reach to waste basket		M212B	29.0	B		Bend to waste basket
									Grasp waste basket	2	G1A	2.0			
									Move waste basket aside (hold while vacuuming rug with right hand) and return		M20B6	43.0			
									Release		RL1	17.0	S8C1		Sidestep to position vacuum sweeper
									Hand aside		RL2E	2.0			
												31.9	AB		Arise
												124.9			
2996	Towels, paper, dispose of											60.0	W4P		
									Reach to handle		R10B	11.5			
									Grasp handle		G1A	2.0			
									Lift cover		M10B	12.2			
												12.2	M10B		Dispose of towels
												2.0	RL1		
									Close cover		M10B	12.2	RL1		
									Release		RL1	2.0			
												114.1			
2997	Clear wood blocks from area											18.6	TK		Walk to blocks
												300.0	W20P		
												29.0	B		Bend
												3.5	G1B		Grasp blocks
												7.1	M2B5		
												5.6	G2		
												31.9	AB		Arise
												150.0	W10P		Walk to block storage
												29.0	B		Bend
												2.0	RL1		Release
												31.9	AB		Arise
												150.0	W10P		Return to work
												18.6	TBC1		
												777.2			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO. FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMV	RN	NO.	DESCRIPTION - RIGHT HAND
2998	Move sledge hammer and block aside after use										G1A AP2	29.0 2.0 18.0 2.0 10.6 31.9 34.1 29.0 2.0 16.2	B G1A MB15 AP2 AS SB12C2 B G1A AP1		Bend Pick up sledge hammer Step to block Pull block free & pick up
									Lower other end of sledge Release		MB15 RL1	7.5 31.9 18.6 30.0 29.0 2.0 5.6 2.0 18.0 2.0 31.9 353.3	D2E AB TBC1 W2P B RL1 G2 RL1 AB		Walk aside Bend Release block Regrasp handle of sledge Release handle of sledge Arise
2999	Return bolts, nuts, washers, clamps, heel etc. to bins											12.2 2.0 10.5 24.7	M10B RL1 R10B		Move into bin Release parts Reach to balance
3000	Clamp (spring), install U-MCPC102											14.4 2.0 18.7 9.1 2.0 46.2	R14B G1A M16C PIESE RL1		To clamp Move to fixture
3001	Lay aside each clamp screw or washer											12.9 2.0 14.6 2.0 31.5	R12B G1A M14B RL1		Reach to clamp Grasp Lay aside on table
3002	Lay aside gauge on bench											18.7 2.0 10.1 30.8	M16C RL1 R12BM		Move to bench with care Release Return hand
3003	Indicator and swivel clamp, return to box 6XX-MJPIR01								Reach to box Grasp box Hold box		R10B G1A APB	11.5 3.5 16.2 5.2	R10B G1B MB MC		Reach to indicator Grasp indicator Move indicator to box Move indicator into box

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Change 2, August 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALVE OBSERVED	LOW VALVE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	THU	RH	NO.	DESCRIPTION - RIGHT HAND
3003	(continued)											26.6	P2NED		Position indicator against stop
												26.6	P2NED		Position indicator into slot
												2.0	RL1		Release indicator
												11.5	R10B		Reach to swivel clamp
												2.0	G1A		Grasp swivel clamp
												10.6	M6B		Move swivel clamp to box
												5.2	M2C		Move swivel clamp into box
												19.7	P238E		Position swivel into groove
												2.0	RL1		Release swivel clamp
												11.5	R10B		Reach to box lid
												3.5	G1B		Grasp box lid
												10.6	M6B		Move lid to box
												5.2	M2C		Move lid to groove
												26.6	P2NED		Position lid into groove
												8.1	M6A		Slide lid to close box lid
									Release box	RL1	2.0	RL1			
												210.1			
3004	Place aside completed part								Machine time	M.T.			R12B		Reach to part
													G1A		Grasp part
												47.6	M2C840		Part to table
													SS12C1		Side step to table
												2.0	RL1		Release part
												17.0	SS12C1		Back to machine
												66.6			
3006	Obtain small part from bench and lay aside								Obtain part	R16B		15.8			
										G1A		2.0			
										R10B		12.2			
												5.6	G3		
												12.2	R10B		
												2.0	RL1		
												10.2	R10B		
												60.3			Lay aside
3008	Remove unused stock from machine											17.0	SS12C1		From machine
												30.0	V2P		To stock
												29.0	B		Bend and reach
									Reach to stock	R16B			RECH		To stock

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALVE OBSERVED	LOW VALVE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3026	Remove threaded pipe from vise and set aside								Assisting motions		R10B G1A M20B40	18.6 60.0 18.6 11.5 2.0 40.5 37.2 170.0 37.2 29.0 2.0	TBC1 W4P TBC1 R10B G1A M20B40 TBC2 W10F0 TBC2 S RL1		Walk to pipe Reach to pipe Grasp pipe Lift from vise Carry pipe aside Scoop with pipe Release
									Set down other end Release		M4B40 RL1	24.2 2.0 31.9 18.6 60.0 563.3	AS TBC1 W4P		Arise Return to work area
3027	Remove cut piece of pipe and set aside								Assisting motions		R10B G1A M20B40	17.8 22.9 18.6 15.0 18.6 11.5 2.0 40.5 18.6 68.0 18.6 29.0 2.0	M6B D3E TBC1 W1P TBC1 R10B G1A M20B40 TBC1 W4P TBC1 S M10B40 RL1	2	Work pipe up and down Pull pipe free Turn and step to next position Turn back Reach to pipe Grasp Lift pipe Carry pipe aside Scoop
									Release pipe		RL1	31.9 2.0 31.9 18.6 60.0 427.5	M10B40 RL1 AS TBC1 W4P		Lower other end Release Arise Return
3028	Get and return rag											18.6 30.0 29.0 12.2 2.0 31.9 18.6 30.0 18.6 15.0 17.0 18.6 15.0 256.5	TBC1 W2P S M10B G1A AS TBC1 W2P TBC1 W1P M10B BMT TBC1 W1P		Turn Walk to rag Bend Reach rag Grasp rag Arise Turn Walk Turn Walk Toss rag Turn Walk

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	THW	RH	NO.
3132	Loosen, adjust, and tighten thumb screw clamp											29.0 18.6 2.0 2.9 2.0 5.0 4.0 5.8 4.0 2.5 2.0 8.9 2.0 8.0 8.6 8.9 2.0 2.0 7.5 6.0 8.7 10.6 6.0 8.0 31.9 196.9	B R20B Q1A M1B RL1 R1B Q1A M1B RL1 R1B Q1A M6B RL1 R6E R6B M6B Q1A RL1 R1B Q1A M1B AP2 RL1 R6E AB	2 2

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3135	Clamp (C-type), place on rail flange 10-MCPC01								Hold			16.2	T908	3	Turn hand
												6.0	RL1	3	Back for
												6.0	G1A	3	Clearance
									Push clamp under Rail			16.2	T908	3	Turn nut
												13.4			
									Release clamp		M084	2.0	G1A		Grasp clamp
									Move hand back		(R2B)	5.6	G2		
									Grasp rod		(G1A)	6.1	H4A		Pull clamp against nut
									Assist		(G1A)	4.9	H1A6		and lift to rail
									Hold		M1A6	6.1	H4A		Push clamp back
												2.0	RL1		To engage rail flange in slot
												4.0	R2B		Reach to nut
												88.5			
3137	Clamp (machine table), loosen & tighten 7.4-SHCL01											15.1	R15B		Reach to tool tray
												2.0	G1A		Grasp box wrench
												15.2	M12C		Move to 1st nut
												27.3	P1SSE	2	Position wrench
												16.2	APB		Apply pressure
												6.0	RFA	3	Move wrench
												6.0	MFB	3	
												2.0	RL1		Release
												10.3	M6C		Move to 2nd nut
												27.3	P1SSE	3	Position wrench
												16.2	APB		Apply pressure
												6.0	RFA	3	Move wrench
												6.0	MFB	3	
												2.0	RL1		Release
												9.2	M6C		Move to 3rd nut
												27.3	P1SSE	3	Position wrench
												16.2	APB		Apply pressure
												6.0	RFA	3	Move wrench
												6.0	MFA	3	
												2.0	RL1		Release
												15.2	M15B		Move wrench to tray
												2.0	RL1		Release wrench
												241.5	x 2 for		loosen & tighten 3 bolts with box wrench
												2 x 241.5	x 483.0		

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Change 2, August 1971

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3139	Tighten or loosen screw in C' clamp											11.5 2.0 18.8 9.4 16.2 4.0 61.9	R10B G1A T180G T180G AP1 RL1	2 2 2 2	Reach to clamp screw Grasp Turn screw Turn hand Release screw
3141	Clamp (cam action), tighten and loosen 66X-MCPCOT1											12.9 2.0 13.4 16.2 2.0 PROCESS TIME 12.9 2.0 16.2 13.4 2.0 93.0	R12B G1A M12B APB RL1 R12B G1A APB M12B RL1		Reach for locking handle Grasp handle Move handle up Apply pressure to tighten Release Reach for locking handle Grasp handle Apply pressure to loosen Move handle down Release
3142	Clamp (hold down), adjust 66X-MCPCA01								Reach for back arm	2	R24B	43.0	R24B	2	Reach for back screw handle
									Grasp arm	2	G1A	4.0	G1A	2	Grasp screw handle
									Hold arm			32.4	APB	2	Apply pressure to loosen
									Hold arm			7.0	T45S	2	Turn handle down
									Apply pressure	2	APB	32.4			Hold handle
									Move arm up	2	M2B	9.2			Hold handle
												7.0	T45S	2	Turn handle up to tighten
												32.4	APB	2	Apply pressure to tighten
									Release	2	RL1	4.0	RL1	2	Release
									Reach for front arm	3	R18B	51.6	R18B	3	Reach for front screw handle
									Grasp arm	3	G1A	6.0	G1A	3	Grasp screw handle
									Hold arm			48.6	APB	3	Apply pressure to loosen
									Hold arm			10.5	T45S	3	Turn screw handle down to loosen
									Apply pressure	3	APB	48.6			Hold screw handle

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3147	Apply oil to bearing or part, per application or per squirt											17.0 SSC1			Step to bearing or part
												21.9 EF	2)		
												15.2 ET10/20	2)		Locate part to be oiled
												22.1 M20C			Move can to part
												16.2 P2SE			Position outlet
												16.2 AF1			Apply oil
												2.0 MCB			Lift can away
												12.2 M10B			
												122.8			
3148	Apply grease to medium part											18.6 TBC1			Walk to grease
												30.0 W2P			
												18.6 R20B			Reach into grease
												2.0 G1A			Pick up grease
												18.2 M20B			
												18.6 TBC1			Walk to part
												30.0 W2P			Rub grease on part
									Turn part over		T90M	42.4 MCB	4		
											RL1	8.5			
											T90M	2.0			
											G1A	8.5			
											T90M	2.0			
												42.4 MCB	4		Rub grease on part
												250.3			
3149	Lubricant, apply grease with a paddle 699-BLVLA01											13.4 M12B			To work
												91.2 M12C	6		Apply grease carefully
												104.6 per sq. ft.			
3150	Spread oil with paint brush (small part)											13.4 M12B			Oil on brush to part
												9.4 T180B			Turn bristles down
												55.2 M2B	12		Brush
												13.4 M12B			Move away
												91.4			
3152	Bearing (motor), lubricate 699-M1UBL01											18.6 TBC1			
									Reach to bearing oil can		RCB	29.0 S			Get oil can
									Grasp cap		G1B	2.0 G1A			
									Lift cap		MFA	14.6 M14B			Move to motor
												3.5			
												2.0			
												8.0 M4C			Move to bearing oil hole
												5.6 P1SE			Position oil can
												31.8 APA	3		Squirt oil
												6.0 RL1	3		Release
									Release cap		RL1	12.2 M10B			Move to opposite bearing

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3152	(continued)								Reach to other oil cap		M10B	12.2			
									Grasp cap		G1B	3.5			
									Lift cap		M1A	2.0			
												8.0	M1C		Move to oil hole
												5.6	P1SE		Position oil can
												31.8	APA	3	Squirt oil
												6.0	RL1	3	Release
									Release cap			2.0			
												31.9			Arise
												236.3			
3153	Cup (grease), screw down 699-M1UCS01											29.0	S		Stoop
												18.6	R20B		Reach to fitting
												2.0	G1A		Grasp fitting
												2.0	G2		Regrasp to turn
												100.0	TS		Turn 1 revolution
												2.0	RL1		Release fitting
												155.6			
3154	Remove and reinstall grease cup											29.0	S		Stoop
												18.6	R20B		Reach to fitting
												2.0	G1A		Grasp fitting
												40.0	M1B	20	Move cup 1/2 rev.
												40.0	RL1	20	Releases after moves
												40.0	G1A	20	Grasp after reaches
												40.0	R1A	20	Reaches to next move
									Reach for cup	(R20A)		19.2	M20A		Move cup to other hand
												5.6	G3		Transfer grasp
												18.6	R20B		Reach for grease gun
												2.0	G1A		Grasp gun
												18.2	M20B		Move gun
									Reach with cup to gun head	R10B		11.5			
									Regrasp	2	G2	11.2			
									Move gun head to cup	M2C		5.9			
									Position gun head to cup	P1SE		5.6			
									Grasp gun head	G1A		2.0			
									Move head & cup	M10B		12.2	M10B		Move gun
									Reach to gun	R10B		11.5	(G2)		Regrasp gun
									Regrasp	G2		5.6			
									Grasp gun	G1A		2.0			
												5.6	G2		Regrasp gun
									Release gun & head	RL1		2.0			
												18.2	M20B		Lay gun aside
												2.0	RL1		Release gun
												13.1	R20A		Reach for cup
												5.6	G3		Transfer grasp
									Reach hand away	(R20E)		22.1	M20C		Move cup to fitting
												5.6	P1SE		Position cup
												10.0	M1B	5	Move cup 1/2 rev.
												10.0	RL1	5	Releases after moves
												10.0	G1A	5	Grasps after reaches

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	I. NO.	LN	TNU	RH	NO.	DESCRIPTION - RIGHT HAND
3154	(continued)											10.0 16.7 31.9 503.5	R2A R2OE AS	5	Reaches to next move Reach hand away Arise
3155	Gun (grease), attach to Zerk fitting and remove from fitting, hand operated grease gun U-BLXKAO1								Reach to gun head Grasp gun head Move gun head to fitting Position gun head Release gun head Reach to gun Grasp gun Release gun Reach to gun head Grasp gun head Disengage gun head Move away from fitting Release gun head	R2OB G1A M12C P3SE RL1 R14A G1A RL1 R14B G1A DZE M12B RL1	18.6 2.0 15.2 43.0 2.0 10.5 2.0 5.6 8.1 2.0 14.4 2.0 7.5 13.4 2.0 148.5	M14B (M12B) (M12B)		Raise gun Move gun to follow LH Move away from fitting	
3156	Pump grease gun handle once against major resistance or several times against minor resistance			.0010	1	.0010	1	.0010							
3157	Oil - hole (no cover)											29.0 22.1 5.6 100.0 19.2 31.9 206.8	S M20C P18E TS M20B AS		Stoop Move oil can to hole Position spout Depress thumb pump Move oil can away Arise
3158	Oil - hole (spring lid or ball cover)								Reach to fitting Grasp hinger cover Move cover open Regrasp Release cover Reach away	R2OB G1A M12B (G2) M12 (R2OE)	29.0 18.6 2.0 2.0 22.1 5.6 100.0 0.0 18.2 31.9 229.4	S M20C P18E TS M20B AS		Stoop Move oil can to hole Position spout Depress thumb pump Move oil can away	
3159	Pour 2 oz. oil			.0017	1	.0017	1	.0017							

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RM	NO.	DESCRIPTION - RIGHT HAND
3160	Pour 2 1/2 oz. oil			.0074	1	.0074	1	.0074							
3161	Relocate sander for new cut								To move sander	AP1		34.0	W2FO		Full sander back
									Assist R. H.	M2B		16.2	AP1		To move sander
												10.1	M2B		Move sander
												31.0	W3FO		Relocate machine
												111.3			
3162	Tool, remove from chuck								Hold drill			22.1	M2OC		Wrench to chuck
	U-MIPTR01											5.6	P1SE		Engage with chuck
												9.1	P1SE		Mesh teeth
												32.4	APB	2	Break loose
												4.6	M2B		
												4.0	D1E		Remove wrench
												11.2	O2	2	Palm wrench
												6.4	R4B		Reach to chuck
												2.0	O1A		Grasp
									Aside bit	M1GB		4.6	M2B		Turn to loosen
									Release	RL1		15.8	RL1		Release chuck
												2.0			
												119.8			
3163	Tool, place in chuck and tighten								Reach to chuck	R2OB		18.6			
	U-MIPTR01								Open or close jaws	3 O1A		6.0			
										3 M2B		13.8			
										3 RL1		6.0			
										2 R1B		8.0			
												10.3	M6C		Drill to chuck
												5.6	P1SE		Position in chuck
									Reach to drill	R2A		4.0			
									Grasp	O3		5.6			
												6.4	R4B		To chuck
												4.0	O1A	2	
												9.2	M2B	2	
												4.0	RL1	2	Close jaws
												4.0	R2B		
												16.2	APB		
												11.2	O2	2	Unpalm wrench
												5.6	P1SE		Engage chuck
												9.1	P1SE		Mesh teeth
												4.6	M2B		
												16.2	APB		Tighten
												4.0	D1E		Remove wrench
												15.8	M1GB		Aside
												2.0			
												190.2			
3164	Chuck (lathe), turn 3/4 revolution											13.1	R2OA		To chuck
	604-MEMCT01											6.0	O1A	3	
												48.6	APB	3	
												83.1	M5C32	3	Move chuck 1/4 Rev.
												-	RL2	3	
												32.4	R9B	3	To chuck
												185.2			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3167	Chuck (universal), loosen or tighten 60X-4024CLOJ											18.6 2.0 22.1 19.7 439.2 72.0 414.0 72.0 4.0 18.2 2.0 1083.8	R20B G1A M20C P23SE M10B RL1 R10B G1A D1E M20B RL1		Reach to chuck wrench Pick up wrench Move wrench to chuck Position wrench in chuck Turn Chuck Jaws In or out Disengage wrench Move wrench aside Release wrench Reach to balance
3168	Loosen chuck nut or tighten											182.4 236.4 160.8 579.6	M12C P23SE M12B	12 12	Move To position wrench
3169	Open or close pipe chuck (1-1/4" to 2" ID)											18.6 2.0 16.9	R20B G1A M14C		Reach to "T" wrench Grasp To chuck

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CHIEF 2, AUGUST 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3169	(continued)											14.7 5.6 96.0 22.0 85.8 22.0 16.9 11.2 2.0 9.3 323.0	PLSSD G2 MSB RL1 R5B G1A ML4C PLSD RL1 R8E		Position in socket Regrasp "T" wrench Turn chuck in or out with fingers
3170	Tighten or loosen pipe machine chuck											18.6 2.0 16.9 14.7 7.9 2.0 16.2 12.8 5.6 48.9 6.0 34.5 32.4 18.6 2.0 16.9 11.2 5.6 48.6 33.8 22.4 4.0 14.4 2.0 9.3 407.2	R20B G1A ML4C PLSSD RBA G1A AP1 M4CB G2 M10B RL1 R10B AP1 G2 R20B G1A ML4C PLSD G2 AP1 ML4C PLSD RL1 R14B G1A R8E		Reach to "T" wrench Grasp To chuck Position in socket Align chuck to adjust Regrasp handle Adjust chuck opening Hand tighten Reach to pipe sleeve Grasp Move to "T" handle Position on handle Regrasp for leverage Smug up or loosen Move pipe sleeve and "T" wrench aside
3171	Spacer, position on outside of cutter on key 605-B5USP01											5.6 21.0 2.5 29.1	G2 F2NSE M1A		Regrasp spacer Position spacer to key Move spacer on key

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3173	Mask medium object	.0377	.0228	.0605	2	.0285	1	.0285							
3174	Open and close knife, pocket								To knife	(R10A)		11.2 5.6 8.4 3.5 10.6 4.6 5.6 10.6 5.4 2.0 7.8 5.6 5.6 11.2	G2 G3 R4D G1B AP2 M2B G2 AP2 T90B RL1 R5B G3 G2 G2	2	Knife in R.H. Knife to L.H. To blade Grasp blade Pull blade open a little Pull blade open To knife Adjust hold on knife Knife in R.H.
									To blade	(R10A)					
									Back of blade	G5					
									Blade to handle	AP2 T90B RL2		10.6 5.4 113.7	AP2 T90B		Handle to blade
3176	Lid, install on can U-MKLI01														
									Hold	R6C G1B (R14C) P2SD RL1		10.1 3.5 22.1 21.8 2.0 10.1 63.6 26.5 0.0 159.7	R6C G1B M20C P2SD RL1 R8B G5 APA R3A RL2	6 5	Reach to lid Grasp at edge To top of can Lid on can To top can To push top of can Push lid down Release
									Release	RL2					

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Change 2, August 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3180	Open and close tool case								To case top		R12B G1A	14.2 3.5 26.6	R12C G1B F2KSD		To latch Grasp
									Hold			2.5 5.6	M1A G2		Open latch Regrasp case
									Open top		M10B	12.2			
									Release case top		RL1	2.0			
									To case top		R12B	12.9			
									Grasp		G1A	2.0			
									Close case		M10B	12.2			
									Release		RL1	2.0			
												95.7			
3184	Remove gas tank cap on trimmer and replace											15.8 8.0 16.2 8.0	R16B G1A AF1 M1B		To cap Remove cap

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Change 1, Jan. 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3191	(continued)								Gather rag	2	MFB	4.0			
									Grip rag		O2	5.6	O2		Grip rag
									Wring rag		MFB15	18.0	MFB15		Wring rag
									Wring rag		AP1	16.2	AP1		Wring rag
									New hold		O5	5.6	O5		New hold
									Wring rag		MFB15	15.0	MFB15		Wring rag
									Wring rag		AP1	16.2	AP1		Wring rag
									Let go		RL1	2.0			
												12.2	M10B		Move rag to shelf
												2.0	RL1		Lay rag on shelf
												211.0			
3192	Wash tile, per sq. ft.	.0018	.0014	.0048	3	.0016	1	.0016							
3193	Wash walls, per sq. ft.	.0031	.0014	.0220	9	.0027	1.1	.0030							
3194	Wash hands and/or tools in bucket of water			.0062	1	.0062	.90	.0056							
3195	Hand, wipe with cloth or paper towel								Other hand to rag		R12A	25.8	R30B		Reach to rag
	U-MCLHMO2											2.0	O1A		Grasp rag
												27.1	M30A		Rag to other hand
												5.6	O3		
												71.2	M6B	8	Rub other hand
												2.0	RL1		Release
												24.3	M30B		Rag to bench
												2.0	RL1		
												160.0			
3196	Dip rag in solvent and squeeze											29.0	S		
												13.4	M12B		Into solvent
												53.4	M6B	6	Move in solvent
												8.7			
												2.0			
												11.2	O2	2	
												12.2	M10B		Out of solvent
												22.4	O2	4	Ball up and squeeze
												31.9	AS		
												60.0	W2P	2	To and from
												244.2			
3197	Clean small part before installing											18.6	TBC1		Walk to solvent
												15.0	W1P		with part
												29.0	S		Stoop and lower part
												35.6	M6B	4	Move part in solvent
												31.9	AS		Arise
												18.6	TBC1		Walk to
												15.0	W1P		machine
												25.8			
									Reach to rag		R30B				
									Grasp rag		O1A	2.0			
									Move rag to part		M30A	27.1			
									Grasp part with rag		O1A	2.0			
									Wipe part to clean it	8	M4B	55.2			
									Release part		RL1	2.0			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVEL OBS FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3197	(continued)								Grasp part in rag		G3	9.4 6.1 5.6 7.0 2.0	T1803 W4A R6A G1A		Turn part end for end Move part to L.H. Reach to end of part Grasp
									Wipe part	8	M4B	55.2			
									Release		RL1	2.0			
									Move rag to pocket		M30C	30.7			
									Position rag		P2SE	16.2			
									Release		RL1	2.0			
												414.0			
3200	Brush table											18.6 2.0 18.2 60.4 18.2 2.0 139.4	R20B G1A M20B M23 M20B RL1	6	To brush To work area Brushing Move to aside

ELE MENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO	DESCRIPTION - RIGHT HAND
3202	Blow chips off small part, vine or small fixture											17.2 2.0 20.6 2.2 10.6 2.5 34.2 2.9 20.6 2.0 112.6	R18B G1A M24B G2 AP2 M1A M3B M1B M24B G2 RL1		Reach to air hose Pick up air hose Move air hose to area Regrasp air hose Press valve Open Blow chips off Release valve Move air hose aside Regrasp air hose Release air hose
3203	Blow chips or water off large part of fixture											18.6 2.0 15.8 5.6 16.2 2.0 42.4 60.4 2.9 15.8 5.6 2.0 209.3	R20B G1A M16B G2 AP1 M1A M3B M12B M1B M16B G2 RL1		Reach to air hose Pick up air hose Move air hose to work Regrasp air hose Press valve Open Blow chips from Surface Close valve Move air hose aside Regrasp air hose Release air hose
3205	Wipe small fixture with hand											12.9 13.8 21.2 11.8 59.7	R12B M4B M3B R12E		Reach to fixture Wipe locating surface of fixture Reach to balance
3206	Clean table, fixture, or large part with bench brush											18.6 30.0 18.6 2.0 18.2 18.6 30.0 18.2 201.0 34.1	TBC1 W2P R20B G1A M20B TBC1 W2P M20B G2 M12B SS12C2		Turn toward bench Walk to bench Reach to brush Pick up brush Move brush to balance Turn toward machine Walk to machine Move brush to table Regrasp brush Brush chips off

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ONE FACTOR	LEVEL TWO TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3206	(continued)											17.0 SS12C1 22.8 M3B 18.2 M20B 18.6 TBC1 30.0 W2P 18.2 M20B 2.0 RL1 14.2 R16E 18.6 TBC1 30.0 W2P 578.9			table Shake brush Move brush to balance Turn toward bench Walk to bench Move brush aside Release brush Reach to balance Turn toward machine Walk to machine
3207	Brush off layout table											12.4 M22B 109.2 M20B 92.0 SS22C1 109.2 M20B 20.6 M24B 350.4		6 4 6	Move brush to table Move brush to table Step back and forth Move brush on table Move brush off table
3208	Wipe grease from finger								To rag " Rag to finger Close rag around finger Wipe finger Open rag Close rag around finger " Open rag Rag to bench Release rag		R20B G1A M26A M4A AP2 2 M4B 2 M4A 2 AP2 M4B M26B RL1	18.6 2.0 24.0 6.1 10.6 8.9 16.2 12.2 21.2 8.9 6.2 21.8 2.0 159.4	(M5A) (D2E) M5B (D2E) M5B		Finger to rag Wipe finger Recoil Finger Wipe finger Recoil
3209	Wipe rough surface											97.2 AP1 48.0 M4C 145.2		6 6	
3210	Part, clean grooves/concave corners only 60X-MCLPC01								Move rag to tool " To rag		M10B RL1 R12B	15.8 R16B 2.0 G1A 14.6 M14B 12.2 40.8 T120B 12.0 RL1 40.8 T120B 12.0 G1A 18.7 M16C 5.6 F18E 16.2 APB 15.8 M16B 12.9		6 6 6 6 6	To screw driver or similar tool Wrap rag around tool Wrap rag around tool " Move rag to part Force into corner Move tool cut

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND		NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
3210	(continued)								Move rag off tool		G1A	2.0				
									Away rag		M10B	12.2				
											M20B	18.2	M20B			Away tool
											RL1	2.0	RL1			
												45.6	M12C	3		
												501.4				
3212	Part, medium, clean with rag, part on bench U-BCLPC02								Position part		R16B	12.2	M10B			Rag to part
											G1A	213.6	M6B	24		Wipe one side
											M10B	15.8				
												2.0				
												17.4				Steady
												213.6	M6B	24		Away rag
												12.2	M10B			
												486.8				
3213	Part, small, clean with rag, part on bench U-BCLPC01								Reposition part		(R10A	12.2	M10B			Rag to part
											(G1A	106.8	M6B	12		Wipe one side
											(M6B	8.7				
												2.0				
												8.9				
												106.8	M6B	12		Wipe opposite side
												12.2	M10B			Away rag
												257.6				
3214	Wipe large part, large fixture, machine column, or table top with towel											25.8	R30B			Reach to towel
												2.0	G1A			Pick up towel
												20.6	M24B			Move towel near part
												5.6	G2			Regrasp towel
												13.4	M12B			Move towel to surface
												80.4	M12B	6		Wipe surface
												24.3	R30B			Move towel aside
												2.0	RL1			Release towel
												19.2	R24E			Reach to balance
												193.3				
3215	Wipe off blocks											13.4	M12B			Move rag to part
												87.6	M14B	6		Wipe off part
												13.4	M12B			Move rag from part
												114.4				
3216	Wipe bad surface (complete coverage) 9 sq. ft.											603.0	M12B	45		Wipe surface
												22.7	M30B			Move rag away from surface
												40.0	G2			Regrasp rag
												15.2	M5B	5		Shake dust off rag
												---	M15A			Move rag to other hand
												5.6	G2			Regrasp rag
									Reach to rag		(R15A					
									Contact rag		05					

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL OBS FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RM	NO.	DESCRIPTION - RIGHT HAND
3225	Lavatory, wipe with rag											26.8 159.0 27.6 74.8 288.2	M12B M10B M4B SS15C2	2 15 4 2	Rag to surfaces Wipe surface Wipe chrome Sidestep to next lavatory
3226	Wipe 1 sq. ft. of flat machine area (dirty)											536.0 424.0 56.0 1016.0	M12B AP2 O2	40 40 5	Wipe surface 1 sq. ft.
3227	Wipe 1 sq. ft. of flat machine area (dusty)											268.0 212.0 28.0 508.0	M12B AP2 O2	20 20 5	Wipe surface 1 sq. ft.
3228	Wipe 1 sq. ft. of irregular machine area (dirty)											536.0 848.0 112.0 92.0 76.0 1664.0	M12B AP2 O2 M2B R2E	40 80 20 20 20	Wipe surface 1 sq. ft.
3229	Wipe 1 sq. ft. of irregular machine area (dusty)											268.0 424.0 56.0 46.0 38.0 832.0	M12B AP2 O2 M2B R2E	20 40 10 10 10	Wipe surface 1 sq. ft.
3230	Wipe oily threads or part											25.5 5.6 5.6 55.2 5.6 58.4 5.6 20.6 182.1	M24C DE P18E O2 M4B O2 M14B O2 M24B		Rag to oily area Rag on oily area New hold on rag Wiping motion For clean part of rag Along length of area Rag aside
3231	Wipe part (small)								Pick up part		R16B O1A M10B O2	15.8 2.0 12.9 18.2 160.0			Rag to part Wipe part
									Turn part		R11 R10A O1A M10B M16B R11	2.0 8.7 2.0 12.9 160.0 15.8 2.0 182.1	M2B	20	Wipe opposite side

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TRV	RN	NO.	DESCRIPTION - RIGHT HAND	
3232	Wipe part (medium)								To part - to steady	4	R16B G1A AP1	116.0 63.2 8.0 64.8	B	4		
												18.2 960.0 121.6 136.4	M20B P5B AB SSC2	20x4	Rag to part Wipe part	
								Hand off	4	RL1 R16E	8.0 14.2 1510.4			4	Move to another position	
3233	Wipe part (large)											290.0 18.2 1608.0 319.0 682.0 290.0 319.0 3526.2	B M30B M12B AB SSC2 B AB	10 20 10 20 10	To part Rag to part Wipe part	
3234	Clean glass								Move hand to hold window	(M14B) (G5)	21.5 2.0 20.6 84.8	R24B G1A M24B AP2		8	Reach for cloth Grasp cloth Move to glass Pressure cloth to glass	
								Move hand from window		(M14B)	116.8 20.6 2.0 268.3	M14B M24B RL1	8	8	Move cloth across glass Move cloth to bench Release cloth	
3235	Clean vision port on helmet											17.2 2.0 7.5 17.0 30.5 17.0 5.2 2.0 98.4	R10B G1A D2E M10B M4A M10B M2C RL1		5	Reach for rag in pocket Grasp rag Remove rag from pocket Move rag to port Wipe port Return rag to pocket Push into pocket Release
3236	Clean vision port, don, and remove sandblast helmet assembly								Grasp helmet		R5B G1A	29.0 7.8 2.0 31.9 20.0 7.3 2.0 10.5 2.0 7.5	B R5B G1A AB ET ET RL1 R14A G1A D2E			Bend Reach to helmet Grasp helmet Arise Inspect helmet Release Reach for rag Grasp rag Pull rag from pocket

ELEM. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3240	(continued)											185.4	M24B	9	Move scraper away from surface
												3676.9 per 9 sq.ft.			
												3676.9 ÷ 9 = 408.5			per sq.ft.
3241	Part (small), wipe with rag 60X-MCLPW01								Move towel to cutter Wrap towel around cutter Wipe cutter shank Regrasp towel	6	M10B M2B G2	12.2 4.6 27.6 5.6 50.0			Hold cutter
3243	Wipe off sign with fine fabric								Reach to sign Hold sign Apply pressure Release sign		R12B G5 AP2 RL2	12.9 12.9 13.4 69.0 12.2	R12B G1A M12B M9B M10B	6	Reach to cloth Grasp cloth Move to sign Rub off shavings (6 times) Transport cloth to table Release cloth
												2.0 122.4	RL1		
3244	Surface, clean with scraper, smooth surface, obstructed U-BCLSC02											388.8 254.4 254.4 897.6	APB M8B M8B	24 24 24	Pressure Scrape Return
3245	Surface, clean with scraper, rough surface, unobstructed U-BCLSC05											318.0 207.0 207.0 732.0	APA M4B M4B	30 30 30	Pressure Scrape Return
3246	Wipe surface to be checked or wipe base of tool								Reach to machined Surface Wipe surface with Hand	2	R18B G5 M2B RL2	17.2 0 9.2 0 26.4			
3247	Clean guide plate			.1580	1	.1580	1	.1580							
3248	Adjust each jack to exact height under part								Reach to jack Grasp jack Hold jack		R12B G1A AP1	15.2 2.0 16.2 78.8 64.8 35.6 16.0 30.9 259.5	M12C F23SE AP1 M6B D1E M6C	4 4 4 4 3	Turn Jack Screw In Or out

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
3261	Position connector clamp over wire ends											13.5 9.1 22.6	MIOC PISSE		Move clamp to wire Position
3262	Conduit - EMT - position to coupling or connector - insert 3/4"											13.5 21.8 2.0 37.3	MIOC P2SD MFB		To connector Position Insert
3263	Insert funnel in fill hole											29.0 22.1 5.6 2.0 31.9 90.6	B M2OC PISSE RL1 AB		To sleeve Funnel to fill hole In hole Funnel Stand
3264	Reposition pliers									M2B		4.6 5.6 3.4 5.6 5.6 2.5 16.2 43.5	MIC PISSE MIC PISSE G2 MIA AP1		To wire To wire between jaws On wire Along wire Pliers Close pliers
3265	Tool, cutting, position to mark											13.5 25.3 38.8	MIOC P2SD		Move tool to object Align with mark
3266	Remove and reinstall starter in fluorescent fixture								Hand ready with new starter			25.8 2.0 16.2 2.8 4.0 24.3 5.6 5.6 24.3 3.4 9.1 16.2 2.8 2.0 16.7 160.8	R3OB G1A AP1 T3OB D1E M3OB G3 M3OB MIC PISSE AP1 T3OB RL1 R2OE		To old starter Remove starter Toward other hand Old starter to L.M. Toward starter socket Starter in socket Hand aside
									New starter to R.M. Hand aside		Q3 R2OE				
3267	Position tape to wire for taping splice								Wire in L.M.			11.8 5.6 5.6 10.6 2.9 36.5	MOC PISSE G2 AP2 MLB		Tape to splice Tape Prepare to tape

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
3268	Back off threading tool											279.0 20.0 317.7 616.7	M36B M7A M36B5	10 10 10	Handle back Set ratchet Back off
3269	Position threading tool and remove after threading								Die		M12C7 P1E2 O2	18.3 5.6 5.6	M12C7 P1E2		Tool to conduit end Tool on conduit end
									Press die to start Die		W1P AP1 O2 D2E M12B7	15.0 16.2 5.6 7.5 14.2 88.0	W1P D2E M12B7		Forward Remove tool Tool aside
3270	Push No. 10 wire into place for forming in electrical boxes											17.2 2.0 32.4 5.0 2.0 10.5 69.1	R18C O1A A1C M1A RL1 R10E		To wire Place thumb on wire Apply pressure Move wire into place Release Hand aside
3271	Reach for wire and position											11.5 2.0 8.0 9.1 2.0 10.5 43.1	R10B O1A M4C P1SSE RL1 R10E		To wire Wire to position Position wire Hand aside
3273	Position small wrench to nut or bolt and remove after use											22.1 25.3 4.0 12.2 63.6	M20C P2SSD D1E M10B		Move to nut Position on nut Disengage Move away
3274	Rail (venetian blind- bottom), place on folded tapes 739-MOHRP01										R8B O1A M12C P1NSE RL1	10.1 2.0 15.2 10.4 10.4 2.0 50.1	R8B O1A M12C P1NSE RL1		To bottom rail To top of tapes Bottom rail on top Tapes on head rail
3275	Position siding sheet for nailing or bolting (2 men)											91.2 159.6	M12C P2NSD	6 6	Move bar to pry up Edge of adjoining sheets

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Change 2, August 1974

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3289	Position each part in a complex fixture								Move part in fixture		MLOC	13.5	MLOC		Move part in fixture
									Position into fixture		P2MSD	26.6	P2MSD		Position into fixture
									Regrasp		G2	5.6	G2		Regrasp
									Move part into fixture		M3C	6.7	M3C		Move part into fixture
									Position to keys	2	P3MSD	106.8	P3MSD	2	Position to keys
									Shift part to seat	6	G2	33.6	G2	6	Shift part to
									Properly on	6	AP1	97.2	AP1	5	Seat properly
									Keys	6	M2C	31.2	M2C	5	on keys
										2	P3MSD	106.8	P3MSD	2	
									Reach to edge of part		RL1	2.0			Hold down
									Grasp part		R8B	10.1			
											G1B	3.5			
									Move part against	4	M2A47	17.0	SS12C1		8 up back for leverage
									Stops	4	AP1	85.6			
									Release		RL1	17.0	SS12C1		Return to normal
									Reach to top of part		R8B	2.0			
											G5	0			
									Hold down		AP1	16.2			
												27.6	M4B	4	Tap part with hand
												24.4	M4A	4	
											RL2	2.0	RL1		
												710.3			
												29.0	B		Bend to see
									Left hand may follow pattern of the right hand			11.5	R10B		Reach to part
												2.0	G1A		Grasp part
												10.4	M2C	2	Move punch hole over jack
												48.6	P3SD		Position punch
												14.6	EP2		hole on jack
												2.0	RL1		Release part
												31.9	AB		Stand up
												150.0			
3292	Remove part from vise, collet or chuck											17.2	R10B		Reach to vise and
												2.0	G1A		Grasp part
												4.6	M2B		Move out of
												4.0	D1E		Vise
												27.8			

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Change 2, August 197

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMV	RH	NO.	DESCRIPTION - RIGHT HAND
3293	Remove each part from simple fixture											8.7 2.0 4.6 16.2 7.5 39.0	R10A G1A M2B AP1 D2E		Reach to parts Pick up parts Remove to fixture Apply pressure Disengage
3294	Remove each part from average fixture								Reach to end of part Grasp Turn part around boss Regrasp part Work part out of fixture	2	R10A G1A M2B G1A M1B	8.7 2.0 11.6 5.6 5.8	R8A G1A		Reach to part Grasp
									Disengage part Regrasp		D2D G2	5.8 11.8 5.6 36.9	M1B D2D RL1	2	Work part out of fixture Disengage part Release
3295	Remove part from complex fixture											14.4 2.0 15.2 21.0 16.2 15.7 4.0 14.6 2.0 15.8 3.5 20.5 32.4 5.6 34.7 5.6 4.6 11.8 239.6	R14B G1A M12C F2NRE AP1 M2B10 D1E M14B RL1 R16A G1A M2B10 AP1 G2 D3D G2 M2B D2D		Reach for pry bar Pick up bar Move bar to part Position under part Raise one edge Of part Remove pry bar Lay aside on table
									Reach to part Grasp edge		R10A G1B	15.8 3.5 20.5 32.4 5.6 34.7 5.6 4.6 11.8 239.6	R16A G1A M2B10 AP1 G2 D3D G2 M2B D2D	2 2	Reach to part Grasp part Work part loose On keys Regrasp Disengage from key Regrasp Move part to top of fixture Remove from fixture
3296	Remove part from centers											14.4 2.0 4.0 4.6 4.0 29.0	R14B G1A D1E M2B D1E		Reach to part Grasp Remove from center Move away Remove tail

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RM	NO.	DESCRIPTION - RIGHT HAND
3298	Measure location											136.0 29.0 10.3 16.2 8.0 16.2 2.0 31.9 136.0 29.0 24.4 2.0 16.2 74.4 31.9 68.0 69.4 700.9	W8PO KOK M6C P2SE MAC P2SE RL1 AKOK W8PO KOK R2SB G1A P2SE TBC2 AKOK W4PO KOK		To location To location with rule Move to position Stand up Walk to other end Rule 2 To base shoe At saw box
3299	Position saw and hand cut								Hold and slide board		R10B G1A M3B G2	11.5 2.0 5.7 5.6			
3301	Place & remove sign from pantograph machine (per sign)											13.5 21.8 406.4 556.5	M10C P2SD M14B	34	Position saw Saw 2 x 4 (17 dbl. moves)
												22.9 2.0 45.0	R2GB G1A W3P		Reach 50" - assist of 6" ratio Pick up sign Walk to machine table carrying sign Transfer to left hand
									Release material in place on machine table		RL1	2.0 8.6	G3 R6B		Reach to material on machine table Grasp Walk to bench Place material on bench
3302	Turn block to perform cut								To near side		R6B G1A AP2 M6B10 RL1 R8B G1A M2B10 G2	14.4 2.0 10.6 13.8 2.0 10.1 2.0 9.0 5.6	R14B G1A AP2 M6B10		To far side Grasp block To turn block Turn block
									Release Top of block Grasp block			10.1 2.0	M2B10 R8B		Lay block down Release
									Regrasp			10.1 2.0 10.6	G1A AP2		To far side Grasp block To turn block

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	RN	NO.	DESCRIPTION - RIGHT HAND
3302	(continued)								Release		MGB10	13.8	MGB10		Turn block
									Top of block		RL1	2.0			
									Grasp block		RBB	10.1			
											G1A	2.0			
											MGB10	9.0	MGB10		Lay block down
											G2	5.6	G2		Regrasp
											M16B10	21.4	M16B10		slide block down
											RL2		RL2		
												156.1			
3303	Position a pneumatic hand chipper or electric hand hammer to hole and remove from hole										D1E	4.0	D1E		Disengage hammer
											M24B	20.6	M24B		Remove hammer from hole
											M24C	25.5	M24C		Return hammer to hole
											P2BE	16.2	P2BE		Position hammer
											G2	5.6	G2		Regrasp
												4.9	M3A		into hole
												76.8			
3304	Unfold drop cloths or fold											18.6	TBC1		Turn
												85.0	W5PO		Walk to drop cloth
												18.6	TBC1		Turn
												29.0	B		Bend
												15.8	R16B		Reach to drop cloth
												2.0	G1A		Grasp fold
												24.3	M30B		Open fold
												2.0	RL1		Release drop cloth
												15.8	R10B		Reach to drop cloth
												2.0	G1A		Grasp ends of drop cloth
												34.0	W2PO		Open fold by walking back
												20.6	M24B		
												2.0	RL1		Release drop cloth
												15.0	W1P		Step forward
												15.8	R16B		Reach to drop cloth
												2.0	G1A		Grasp drop cloth
												10.6	MGB		Lift folds to get at folded ends
												2.0	RL1		Release
												11.5	R10B		Reach to end of drop cloth
												3.5	G1B		Grasp
												12.2	M10B		Lift up drop cloth
												25.8			
												2.0			
												10.6			
												2.0			
												362.7			
3305	Drag or position hose per occurrence											29.0	B		Bend
												15.8			Hold gun
												2.0			
												31.9	AB		Arise from bend
												34.1	BBC2		Side step 12"
												170.0	W10PO		Walk with hose

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TIME	HN	NO.	DESCRIPTION - RIGHT HAND
3308	Open or close pipe cutters								Reach to handles		R20B	18.6			
									Grasp spoke		G1A	2.0			
									Move cutters in or out	3	M6B	26.7			
										2	RL1	4.0			
										2	R6B	17.2			
										2	G1A	4.0			
									Release spoke		RL1	2.0			
									Balance hand		R6E	8.0			
												82.5			
3309	Bring two large flange joints together; place pin through bolt holes, and remove pin											21.5	R24B		Reach to flange
												2.0	G1A		Grasp edge
									Reach to fixed flange		R12A	9.6			
									Grasp edge		G1A	2.0			
									Grip flange		AP1	16.2	AP1		Full flange to butt against existing joint
												0.1	M6A		
									Release flange		RL1	2.0			
												5.6	G2		Regrasp flange
												4.6	M2B		Turn pipe
												48.6	F3ED		Align flange holes
												2.0	RL1		Release
												18.6	TBC1		Stop to pin
												15.0	W1P		
												18.6	R20B		Reach
												2.0	G1A		Grasp
												18.2	M20B		Lift pin
												18.6	TBC1		Stop to joint
												15.0	W1P		
												22.1	M20C		Move pin to flange
												11.2	F1ED		Position
												2.0	MFB		Shove thru 1st flange
												21.8	F2ED		Reposition
												6.7	M3C		Move thru other flange
												11.2	G2	2	Push and lift
												48.6	AP1	3	pin to align
												6.0	MFB	3	flange joints
												2.0	RL1		Release
									Reach to pin		R20B	18.6	R20B		Reach to joined
									Grasp pin head		G1A	2.0	G1A		flanges for support
									Pull pin free		M6B	8.9			
												7.5	G2Z		Release grip
									Set pin aside		M20B	18.2			
									Release		RL1	2.0			
												517.0			
3310	Place pin in flange holes to align bolt holes											21.5	R24B		Reach to pin
												2.0	G1A		Grasp pin
												25.5	M24C		Move to flange
												5.6	F1SE		Position in flange hole
												6.7	M3C		Move to opposite flange hole
												21.8	F2ED		Position in 2nd flange
												16.2	AP1		Pull or push to align
												6.7	M3C		Move into place

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
3310	(continued)								Release flange	RL1		2.0	RL1		Release pin
									Reach to pin	R24B		21.5			
									Grasp pin	G1A		2.0			
									Pull pin free	M6B		8.9			
										D2E		7.5			
									Set pin aside	M24B		20.6			
									Release	RL1		2.0			
												170.5			
3311	Remove pins, gasket and scrap material and set aside											21.5	R24B		Reach to hammer
												2.0	G1A		Grasp handle
												20.6	M24B		Move to position
												11.2	G2	2	Regrasp
									Press down on gasket	(API)		29.4	P1SSD	2	Position claw on pin
												32.4	API	2	Pull handle down
												8.0	D1E	2	Pull pin free
												18.4	M2B	4	Knock pins from claw
										8		15.2	M12C		Move to 2nd pin
												18.2	M20B		Move hammer aside
									Release pressure	(G5)		2.0	RL1		Release
									Reach to cut gasket	R6B		8.6			
									Grasp edge	G1B		3.5			
									Move to lay aside	M12B		13.4			
									Release	RL1		2.0			
												17.2	R18B		Reach to scrap
												3.5	G1B		Grasp edge
												5.6	G2		Regrasp
												17.0	M18B		Move to lay aside
												2.0	RL1		Release
												251.7			
3312	Carry pipe section to machine and set aside after machining (pipe under 4' long)											18.6	TBC1		Walk to pipe section
												150.0	W10F		
												29.0	S		Bend to pipe
									Assisting motions	R20B			R20B		Reach to pipe end
										G1A		2.0	G1A		Grasp pipe
										M6B20		20.3	M6B20		Lift either end
												31.9	AS		Arise
									Lift pipe	M20B40		40.5	M20B40		Balance pipe to carry
												18.6	TBC1		Carry pipe to machine
												170.0	W10FO		end
												18.6	TBC1		Walk to bench or
												85.0	W5FO		truck
												29.0	S		Bend
									Assisting motions	M20B20		29.6	M20B20		Lower pipe
										RL1		2.0	RL1		Release
										R6E		8.0	R6E		Balance hand
												31.9	AS		Arise
												18.6	TBC1		Return to machine
												75.0	W5F		
												778.6			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TIME	RM	NO.	DESCRIPTION - RIGHT HAND
3355	(continued)										M18A20 Q2	28.9 5.6 29.0 15.7 31.9	M18A20 Q2 S M08B AB		Raise tie Grip pinch bar Hold tie up Pull bar from under tie Stand up to move
												204.6			
3356	Rod (gauge), place on gauge flange 910-M08MFO1								Relax hold Allow rod to slide through band To guide rod part way under rails Reach over rail Grasp rod Assist Assist			29.0 53.6 30.9 5.6 11.5 2.0 5.6 15.8 2.0	S M24B12 M30B12 Q2 M2A12 RL1	2	Stoop Move back and slide out under rail Push further under Pre-position hook and retain hold
3358	Jack, place under rail and tighten, raise jack one stroke 910-M11JFO1								Drop handle To jack Grasp Assist Assist Retain hold Steady jack			31.9 107.9 37.2 2.0 29.0 15.3 16.2 12.9 2.0 10.1 2.0 16.2 2.0 2.0	AB TDC2 S MSC10 APB MCA10 M0B G1A M5A RL1	2	Turn to rail w/jack Stoop with jack Place jack in position near rail And push Slide under rail Release carrying handle Reach to hoisting handle socket Grasp and Move up and down to tighten against Rail and release
3359	Handle, place in jack 910-M11JFO2											29.0 2.0 29.5 14.7 75.2	S M5B G1A M18C10 P18D		To jack To handle Take hold handle Handle to socket Handle into socket
3360	Level, place on rail 910-M11LFO1								Idle			29.0 17.0 16.0 5.6 12.8 5.6 2.0 31.9 119.9	S M5C0 P18ED Q2 M4CA P18E RL1 AS		To rail with level One end to rail Place on rail Shift hold Other end to rail Place on rail Release level Straighten

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ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	MO.	LN	TMV	RN	NB.	DESCRIPTION - RIGHT HAND
3999	(continued)														
3400	Kneeling on knee boards move to next location								Reach for balance		R22E	18.0 76.7 15.0 74.4 29.0 14.2	R22E AKBK WIF TBC2 S R12D	2	Reach for balance Arise Walk 1 pace Turn body Bend Reach for board
									Grasp		G1A	2.0	G1A		Grasp
									Regrasp		G2	5.6	G2		Regrasp
									Lift board		ML2B	13.4	ML2B		Lift board
												31.9	AS		Arise
									Move board		ML0B	74.4 29.0 17.0	TBC2 S ML0B	2	Turn body Bend Move box d
												29.0	S		Arise
									Reach for balance		R22E	69.4 36.0 40.0 14.2 36.0 625.2	EKE R22E ET LH6 R22E	2 2 2 2	Kneel Reach for balance Look at leg Move leg Reach for balance
3401	Carry cardboard box of insulation brick											120.0 37.2 17.2	WOP TBC2 RL0B		To material Turn To sides of box
												0	G5		Contact grasp
												16.2	AF1		To gain control
												8.9	WCB		Slide box out
												5.6	G2		For better control
												11.6	MA013		Lift box
												18.6	TBC1		Turn to walk
												120.0	WOP		To work site
									Better control		G2	29.0	S		With box
									Set edge down		MB013	5.6			
												13.6	G2		Better control
												13.6	MA013		Bring box to rest
												0	RL2		Release
												31.9	AS		Arise
												854.6			
3402	Get and place nut on bolt and engage threads											17.2	RL0B	1	To nut
												2.0	G1A	1	Pick up
												5.6	G2	1	Gain control
									To bolt head	1	AL2C	20.4	AL2C	1	Nut to bolt
									To hold in place	1	WT	5.6	WT	1	Align during move
												4.0	MTB	2	Place nut on bolt
												8.0	MTB	4	Turn back and forth to start Turn forward

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL OR FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMW	RH	NO.	DESCRIPTION - RIGHT HAND
3402	(continued)											8.0 8.0 8.0 26.8	RL1 RFB G1A	4 4 4	Release nut Reach back Grasp nut
3403	Nut setter, place head on nut 910-MTFN01								Reach to handle Assist Assist Assist Assist Assist Release handle	1 G1B G1A G2 M2B M10B M10C P1BBD RL1	12.9 2.0 5.6 4.6 12.2 13.5 14.7 2.0 67.5	R12B G1A G2 M2B M10B M10C P1BBD		Reach to handle Grasp Lift to clear rail Move socket to side Move socket to nut Place socket on nut	
3404	Remove old nuts from joint bar bolts	.0140	.0125	.0650	5	.0130	1	.0130							
3405	Nut setter, remove from nut 910-BTFN01								To handle Gain control Assist Retain hold	1 G1A G2 M3B M3B	9.6 9.6 5.6 5.7 8.9	R12A G1A G2 M3B M3B		Reach to handle Gain control Disengage from nut Aside to clear rail	
3406	Nut, seat with wrench and remove wrench 910-BTLM01								Assist Assist Assist Assist Assist Assist	2 2 3 3 3 3	APA M10B7 AFB AFB M10B7 M10B7	21.2 56.0 48.0 45.3 5.7 15.1 191.3	APA M10B7 AFB M10B7 D1D M10B7	2 2 3 3	Push on wrench To turn nut Push on wrench To turn nut for final tightening Wrench from nut Lift to carry
3407	Nut, turn down, seat with nut setter. Machine time not included. 910-MTFN01								Release guide handle Reach to clutch lever Grasp and move lever To engage clutch Move lever Disengage clutch Release lever	RL1 R12A G1A G2 M5A M5A RL1	2.0 9.6 2.0 5.6 8.1 8.1 2.0 2.0 39.4		RL1		Hold guide handle Release lever
3408	Turn nut down (by hand) 2 turn								Hold			2.0 2.0	G1A M1B	1 1	Grasp Turn forward

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO. FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3408	(continued)											2.0 2.0 8.0	R11 R7B	1 1	Release Reach back
3409	Nut, turn with wrench 910-MTLMT01								Assist Assist Assist Assist	M4C7 P288D M30B7 D1D M30B7	10.7 25.3 28.0 3.7 28.0	M4C7 P288D M30B7 D1D M30B7		Wrench to nut Place wrench on nut Turn nut 1/2 turn Remove wrench Wrench back to near nut	
3410	Clamp small, medium, or large part on carriage								Reach for sheet metal Hold sheet against clamp	R12B (5)	85.0 12.9 6.0	M4FO R12B G1A		3	Walk front of carriage Reach for clamp screw Grasp clamp screw
											16.2 6.0 6.0 21.5 6.0 16.2 6.0 6.0 21.5 2.0 10.6 2.0 21.5 2.0 10.6 2.0 11.8	T90B R7B R11 R24B G1A T90B R7B R11 R24B G1A AP2 R11 R24B G1A AP2 R11 R12B		3 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	Tighten clamp screw Release clamp screw Reach for second clamp Grasp clamp screw Turn clamp screw Release clamp screw Reach to clamp screw Grasp clamp screw Final tightening Release clamp Reach clamp Grasp clamp Final tightening Release clamp Reach aside
3411	Unlock and drop arm for removing part or raise and lock arm - small machine								Release sheet metal Reach aside	(12) R12B	51.0 18.6 2.0 32.4 15.8 2.0 15.8 2.0 32.4 18.2 2.0 11.8 17.0 221.0	M3FO R20B G1A AF1 R16B G1A R16B G1A AF1 M20B R11 R12B W1FO		2 2 2 2	To end of machine To lever To arm To arm Lower arm To center of machine
3412	Remove and replace pin on hold down screw										11.5 2.0 10.6	R10B G1A AP2			Reach for pin Grasp pin Pull on pin

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RM	NO	DESCRIPTION - RIGHT HAND
3431	(continued)											16.2 2.0 2.0 17.0 119.4	AP1 MFC RL1 SS12C1		Lock lever in place Release
3432	Adjust speed levers											18.6 15.0 18.6 21.9 18.6 2.0 16.2 8.0 2.0 21.5 2.0 16.2 8.0 2.0 21.5 2.0 16.2 8.0 2.0 18.6 15.0 253.9	TBC1 WLP TBC1 EF R208 G1A AP1 MFC RL1 R24B G1A AP1 MFC RL1 R24B G1A AP1 MFC RL1 TBC1 WLP	3	Step to levers Check speed chart Reach to 1st lever Grasp Pull or push Move to exact speed Release Reach to 3rd lever Grasp Pull or push Move to exact speed Release Step back to operating position
3433	Make adjustment on machine to change die sizes								Reach to 2nd lever Grasp Pull or push Move to exact speed Release		R24B G1A AP1 MFC RL1				
3434	Tighten or loosen wheel to adjust rear guide clamps for holding or releasing pipe								Assisting motions	4 3 3 3 3	R14B G1A M2B30 RL1 R24B G1A AP1 MFB	60.0 17.0 14.4 114.4 8.0 64.5 6.0 48.6 6.0 17.0 60.0 417.9	W4P SS12C1 R14B G1A M2B30 RL1 R24B G1A AP1 MFB SS12C1 W4P	4 3 3 3 3 3 3 3 3 3 3 3	Look to mark Reach to lever Grasp Pull lever down Position to mark Balance hand Walk to rear of machine Reach and grasp lever or wheel Move lever or wheel Release Reach back to turn Grasp to turn Final tighten Return to operating position

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THW	RN	NO.	DESCRIPTION - RIGHT HAND
3532	Pick up stepladder and put down								Grasp ladder		①1A	29.0 2.0 24.1 5.6 31.9 22.7 2.0 14.2 2.0 20.2 4.0 28.7 18.6	S ①1A M20B10 ①2 AS M10B10 RL1 R16E R8B ①1A M3820 R20B		Stoop to ladder Grasp ladder Turn ladder on edge Regrasp ladder Arise Put ladder to shoulder Release ladder Move arm through Adjust on shoulder Reach to ladder (top)
									Release	RL1		29.0 31.9 316.3	S M20B20 AS AS		Turn down Arise
3533	Climb and descend tower 85 ft.			.0373	1	.0373	1	.0373							
3534	Climb truck ladder to tower ladder and return			.0086	1	.0086	1	.0086							
3561	Jack, adjust to approximate height 605-48UJA01								Reach to jack Grasp jack Hold	R16B ①1A APB		15.8 2.0 97.2 27.6 10.0 20.0 2.0 174.6	R16B ①1A APB M2B RL1 R2A RL1	6 6 5 5	Reach to jack screw Grasp jack screw Turn Jack Screw In or out Release jack screw
3577	Cut wire to approximate length								Reach to roll Grasp roll	R16B ①1A		17.2 2.0 2.0 24.3	R16B ①1A ①1A M30B		Reach to wires Grasp Uncoil wires
									Release roll Reach to measuring stick grasp and move to use Regrasp stick Measure wires	RL1 R14B ①1A M14A ①2 MOC P15E		2.0 14.4 2.0 14.4 5.6 11.8 5.6 2.0	M14A ①2 RL1		Move wire up Regrasp stick and wires Release wires

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL FAC- TOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TNM	RM	NO.	DESCRIPTION - RIGHT HAND
3738	(continued)											3.5 31.9 18.6 30.0 13.5 19.7 9.2 21.8 16.2 2.0 255.5	G1B AB TBC1 W2P MIOC P2SSE M5C P2SD AP1 RL1		Grasp Step back to flange Move gasket to flange Position gasket Align to hole Press gasket into place Release gasket
3739	Get out of pick up truck	.0024	.0006	.0084	6	.0014	1.11	.0016							
3740	Get into pick up	.0046	.0010	.0241	9	.0027	1.11	.0030							
3741	Additional movement under pipe in tack welding								Reach for balancing hold	R24B G1A		29.0 21.5 2.0 14.6 21.3 2.0 31.9 122.3	B EF IM6 AB	2 3	Bend under pipe Look at pipe Balance body Arise
3742	Turn assembly around to receive next part								Release hold	RL1					
										R24B G1A AP1 M4B20 M4B20 M20B8 RL1 R10E		34.1 21.5 2.0 16.2 15.8 102.3 15.8 24.1 2.0 10.3 18.6 17.0 37.2 317.1	SS12C2 R24B G1A AP1 M4B20 SS12C2 M4B20 M20B8 RL1 R10E TBC1 W1FO TBC2	3	Step to grasping point Reach to assembly Grasp assembly Lift up Rotate assembly around Set assembly down Slide to working position Remove hand Walk to next part
3743	Position and reposition stencil by eye	.0029	.0013	.0140	6	.0023	1	.0023							
3744	Stick large stencil on guide line	.0360	.0090	.0600	3	.0200	1	.0200							
3745	Select "number" stencil, in sequence			.0070	1	.0070	1	.0070							
3746	Position template on door											23.1 15.2 5.6	M26B M12C G2		Move template to door Move template to door Regrasp

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALVE OBSERVED	LOW VALVE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RM	NO.	DESCRIPTION - RIGHT HAND
3746	(continued)											14.6 32.4 20.0	EF P2SE EF	2 2	Position template To lower part of template Position template
												14.6 32.4 157.9	EF P2SE Per 2 stripes	2 2	
3747	Position template to guard post								Look at right side of post Position template at left side of post		M16C	18.7 16.2 8.7	M16C P2SE E18/14		Move template to right side of post Position to post Look to left side of post
											EF	7.3			
											M1C P2SE	3.4 16.2 2.0 21.5			
												7.3	RL1 R24B		Release template Reach to center of template
												7.3	EF		Look to line up template
												3.5 3.4	G1B M1C		Grasp template Move template
												16.2	P2SE		Position template
												-	RL2		Release template
												19.2 163.6 574.4	R24B		Return hand
												5.2 5.6 4.6 4.6 10.4 11.2 41.6	M2C P1SE M2B M2B M2C G2		
3748	Brush, dip U-BDFBD01													2	Into can Out
														2	Wipe on edge Turn over
3749	Move funnel into oil hole and remove											22.1 5.6 3.6 2.0 14.2	M20C P1SE M2A RL1 R16E		Funnel in N.M. to part Into hole
												10.6 2.0 4.0 13.4 85.3	R20B G1A D1E M12B		Pour in oil To funnel Remove

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LH	THU	RH	NO.	DESCRIPTION - RIGHT HAND
3800	Obtain scale measure and aside								Reach to edge of work Grasp edge of work	R2D 05		21.5 2.0 8.9 25.5 5.9 - 5.6 21.9 5.6 25.5 5.6	R24B Q1A M5C M24C P15E EF G2 M24C P18E	3	Reach to scale Grasp scale Lift from pocket Move to work Position scale to finger Read scale Regrasp scale Move scale to pocket Position in pocket

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3800	(continued)											8.0 2.0 138.0	M,B RL1		Move into pocket Release
3801	Mark-off additional lengths of stock								Regrasp Scale to previous mark Align scale to mark Regrasp scale	G2 M6C P2SE G2		5.6 10.3 16.2 5.6 10.3 16.2	M6C P2SE		Pencil to scale Pencil to reading scale Make mark Pencil away
												2.0 5.7 71.9	MFB H3B		
3802	Door (office), unlock U-MCHDU01								Reach to key ring Grasp key ring Release ring Reach to door knob Grasp knob	(R20A) G1A (RL1) R20B (G1A)		15.6 5.6 6.4 2.0 19.2 2.0 9.1 18.6 22.1 5.6 10.4 2.0 5.4 5.4 4.6 4.0 143.4	R14C P1SE R4B G1A M20A G4B M20C G2 PLHSE MFA T90S T90S D1E		To pocket for key ring Insert hand in pocket To key ring Grasp key ring Key ring to center of body Select key Key to lock Regrasp key Insert key in lock Turn key Turn key Disengage key
3803	Unlock and open window											20.1 2.0 10.6 4.9 15.8 2.0 26.5 81.9	R22B G1A AP2 M3A M16B RL1 R36E		Reach to window lock Grasp window lock Move window lock up Open window Release lock Return hand
3804	Close and lock window											30.0 2.0 10.6 4.9 16.0 4.9	R36B G1A AP2 M3A M16A M3A		Reach to window lock Grasp window lock Move lock up Close window Move lock down

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	(FV/L- NO) FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3619	(continued)											31.9 5.6 13.4 2.0 1516.9	AB O2 M12B RL1		water with hand (Element FWD-4-E Move hose from bucket Hose into sink
3620	Open and close cabinet door											29.0 15.8 2.0 5.4 27.9 2.0 15.5 17.2 2.0 27.9 16.2 5.4 2.0 14.2 31.9 214.4	B R16B O1A T90B M36B RL1 R18E R18B O1A M36E AP1 T90V RL1 R16E AB		Bend to Reach to door handle Grasp door handle Turn handle Open cabinet door Release handle Reach to balance Reach to door handle Grasp door handle Close door Push door tight Turn latch Release latch Reach to balance Stand up
3621	Dispose of rags, paper, etc. in trash can located outside of building											18.6 34.0 29.0 15.8 2.0 31.9 18.6 1060.0 18.2 5.6 14.8 18.2 18.6 1060.0 29.0 2.0 2376.3	TBC1 W2FO B R16B O1A AB TBC1 W200F M20B O2 T18OM M20B TBC1 W200F B RL1		Turn body Walk Bend Reach for bucket containing trash Grasp Arise Turn Walk to outside - trash can Move bucket to trash can Regrasp bucket Turn bucket over Move bucket to side Turn Walk back to locker Bend Release bucket
3622	Cleanup of the job location	.3860	.0050	3.3645	30	.1122	.64	.0718							
3623	Empty scrap metal container and return										R12B O1A M1B8 DZE M12B8	17.0 12.9 2.0 7.1 7.5 18.8 37.2	W1PO R12B O1A M1B8 DZE M12B8 TPC2		Remove machine container
									Same as right hand						

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LM	TMU	RM	NO	DESCRIPTION - RIGHT HAND
3843	Walk obstructed or with load over 50 pounds per 10 paces											170.0	W12P		Walk 10 paces
3855	Check out or in tool											15.8	R3-B		Reach to ring in pocket
									Reach to ring	(E1)A		1.0	G1A		Grasp
									Grasp and regrasp	G1A 2		7.1	H3W		Move to other hand
										G1		7.6			
									Pull open	(AP)		1.4			
									Release ring	(CLB)		4.6			
									Reach to ring	RL1		2.0			
									Grasp and regrasp	R2JB		19.6			
										G1A 2		7.6			
										G2					
									Push closed	(AP)		13.6			
									Release	(H1A)		3.6			
										RL1		1.0			
												30.7	H3OC		Move to pocket
												4.1	P1CSE		Position in pocket
												5.6	G2		Regrasp
												4.6	H2B		Push into pocket
												2.0	RL1		Release
									Reach to ring	R10D		17.3			
									Grasp	(G5)					
										(H1B)		1.0			
										(G2)		5.6			
									Move check from ring	(H4C)		8.0			
												13.2	R12B		Reach to check
												3.5	G1B		Grasp
												22.1	H2OC		Move to ring
												16.2	P2SE		Position on ring
												4.6	H2B		Move on ring
												2.0	RL1		Release
									Move check to clerk	H2OB		18.2			
												11.5	R1OB		Clerk reaches
												5.6	G3		Clerk grasps
												60.0	W4P)		Clerk walks with
												37.2	TBC1)	2	used check
												18.2	H2OB		Clerk moves
									Reach for check	R1OB		11.5			
									Grasp check	G3		5.6			
									Move to counter	H12B		13.4			
									Release	RL1		2.0			
												37.2	TBC1	2	
												360.0	W12P	2	Walk to bin and
												37.2	TBC1	2	return
												29.2	EF	4	Look at bin
												40.0	ET	2	Look to other
												22.5	R24C		Reach to tool
												7.3	G4A		Grasp tool
												3.9	H24B10		Lift tool out
												22.8			

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LM	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3855	(continued)											14.6 14.8 14.6 17.7 17.4 7.3 17.3	IF T18.4 IF SEC1 H18.12 FL1 SEC1		Look at tool Turn tool Look at Step to side Set tool down Return Step back
3856	Tool, small, obtain and place aside											22.8 1.1 7.3 16.2 19.6 7.3 64.3	F14B G1A H18.12 H14B FL1		To tool To work area Aside tool

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION LEFT HAND	NO.	IN	TMU	RH	NO.	DESCRIPTION RIGHT HAND
01	...														
02	...														
03	...														
04	...														
05	...														
06	...														
07	...														
08	...														
09	...														
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74	...														
75	...														

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3865	(continued)										G1A H1J3B	2.0 17.2 31.2 18.6 321.0 18.6 514.8	G1A H1J3B AB TBC1 WFO3 TBC1		Grasp Pick up box Arise Turn Walk Turn.
3866	Locate and pick 3 items from bin											43.2 43.6 2.7 51.2 11.2 54.6 6.2 12.6 137.4	ET EF S R10B G1A H1J3B RL-1 AB	7 6 1/3 3 3 3 3 1/3	Look at bin tags Reach bottom shelves Reach item in bin Grasp Remove item from bin Release part into box Arise
3867	Obtain carrying kit from locker											29.2 2.2 16.2 31.2 37.2 28.7 2.0 147.3	B G1A AP1 AB TBC2 H1J3B35 RL1		Bend Grasp strap Pull Arise Turn around Move bag to bench Release
3868	Obtain and open check ring, return and close								Reach to ring Grasp and regrasp Pull open Release ring Reach to ring Grasp and regrasp Push closed Release		R10A G1A&G2 (AP2 (H2B RL1 R20B G1A&G2 (AP2 (H2A RL1	25.8 2.0 27.1 7.6 10.6 4.6 2.0 18.6 7.6 10.6 3.6 2.0 30.7 9.1 5.6 4.6 2.0 174.1	R30B G1A M30A H30C P1E5E G2 M2B RL1		Reach to ring in pocket Grasp Move to other hand Move to pocket Position in pocket Regrasp Push into pocket Release
3869	Get tool from carrying bag and give to stock clerk								Grasp top of bag Pull open		G1A H6B	18.6 29.0 2.0 8.9 12.9 2.0 9.5 2.0	TBC1) B) R10C G1A) H4B5) RL1)		Turn to tool bag Reach for tool Grasp tool and move aside

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART							
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND	
3869	(continued)											5.4 11.3 17.4 31.2 18.6 14.1 11.5 5.6 104.4	F4C GLA M12B13 AR TBC1 M12B13			Reach for other tool Grasp Lift from bag Arise Turn to window Pass tool to clerk
3870	Get tool from tool box and place in carrying bag								Clerk reaches for tool Clerk grasps tool							
												37.1 14.3 14.6 7.6 11.3 8.4 16.8 37.2 16.8 11.3 158.8	TBC1 FLC GLA M12B5 RL1 F4C M12B5 TBC2 M12B5 RL1			Step to box Reach for tool Grasp tool Move tool aside Release Reach for other tool Lift from bag Step to bag Move to bag Release
3871	Obtain tool from clerk and place in carrying bag											14.1 11.5 5.6 14.1 19.3 11.3 8.9 19.4 2.3 31.9 37.2 195.7	M12B13 RL1 G3 M12B13 E GLA M12B M12B13 RL1 AR TBC1			Move tool to craftsman Craftsman reaches Craftsman grasps tool Move tool from doorway Bend Move tool to bag Release tool Arise Turn to bag and back
									Grasp bag Pull open							

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3873	Rag, get from covered can U-MJPR001											29.0 B 2.0 G1A 13.4 M12B 2.0 RL1 18.7 R16C 2.0 G1A) 5.6 G2) 15.8 M16B			Bend to can Grasp handle of cover Swing back cover Release Reach for rag Grasp rag Lift rag from can
									Reach to cover Grasp cover handle Close cover Release handle		R6B G1A M12A RL1	2.0 12.9 2.0 31.9 137.5	AB		Arise
3874	Obtain and replace pencil											21.5 R24B 2.0 G1A 4.0 D1E 20.6 M24B 25.5 M24C 5.2 M2C 16.0 P1MSD 2.0 RL1 96.8			Reach to pencil Grasp pencil Remove pencil Move to work surface Move pencil to pocket Move pencil into pocket Position clip Release
3875	Obtain note pad from pocket and return											17.2 R10B 3.5 G1B 18.2 M20B 7.9 R8A 2.0 G1A 16.8 G2 24.0 M5B 18.2 M20B 2.0 RL1 5.6 G2 8.9 M6B 5.6 G2 5.6 G2 8.0 M5B 8.7 R10A 5.6 G3 20.4 M18C 11.2 P1SD 5.6 G2 4.6 M2B 2.0 RL1 201.6			Reach to shirt pocket Grasp note pad Remove 3 Regrasp to open 3 Open pad to sheet Release Grasp pad Move to pocket Position in pocket Regrasp Push into pocket Release
									Reach to pad Grasp pad Regrasp to open Open pad to sheet Move to writing surface Regrasp to hold Turn to writing position Regrasp Regrasp held pad Close pad Reach to right hand	3 3	R8A G1A G2 M5B M20B G2 M6B G2 G2 M5B R10A	7.9 2.0 16.8 24.0 18.2 2.0 5.6 8.9 5.6 5.6 8.0 8.7			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO. FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
1880	(continued)								Reach to bag		R14B	29.0	B		Bend
									Grasp		G1A	14.4			
									Open		M4B	2.0			
												17.0	M1HB		Put tape in bag
									Release bag		RL1	2.0	RL		Release tape
												10.4	R1CE		Pull hand out of bag
												31.3	AB		
												52.3			
1882	Tool, obtain from open tool box and aside to tote box or bench top U-MILTOOL											14.2	R12C		Reach for tool
												7.3	G4A		Grasp tools
												6.9	M4B		Move tools aside
												2.0	RL1		Release
												8.4	R4C		Reach for tool
												7.3	G4A		
												13.4	M12B		Lift from tool box
												15.2	M12C		Move to hand box
												2.0	N41		Release
												16.7			
1884	Pick up rag or tool and lay aside											29.0	S		
												12.9	R12B		
												3.5	G1B		Pick up

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TNU	RH	NO.	DESCRIPTION - RIGHT HAND
3884	(continued)											11.2 31.9	O2 AS	2	Use
												15.8 2.0 14.2 120.5	M16B RL1 R16E		Lay aside
3885	Mop truck, get from or return to janitorial closet											30.0 18.6 17.2 2.0 16.2	W2P TBC1 R18B O1A AP1		Walk into janitorial closet Turn to mop truck Reach to truck Get hold of truck Pull truck out of corner
												34.0 2.0 45.0	W2PO RL1 W3P		Let go truck Walk to other end of truck
												18.6 2.0 16.2 70.5 16.2	TBC1 O1A AP1 SS13C2 AP1	2	Get hold of truck Align truck with door Push truck out of closet
												34.0 34.1 16.2 51.0 2.0 18.6 444.4	W2PO SS13C2 AP1 W3PO RL1 TBC1		Turn truck 90° Push truck to sink Let go truck Turn away
3886	Carry rod to rail								Hold rod in Both hands			85.0 29.0 114.0	W5PO S	1 1	Walk and carry rod Stoop to place rod
3889	Jack, get from under rail 910-MTLJ001								Idle			29.0 10.1 2.0 18.3 9.2 31.9 100.5	S R8B O1A W6S20 M2B AS	2	Stoop to jack Reach to handle Grasp Pull from under rail Move jack to loosen Straighten with jack

ELEM- ENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMV	RH	NO.	DESCRIPTION - RIGHT HAND
3890	Hardware, load onto handcar or unladen from or to storage 910-SORHLO2								Assist RH Assist RH Assist RH Assist RH		R10B G1B G2 M6B10	34.0 29.0 11.5 3.5 5.6 13.8	W2P0 S R10B G1B G2 M6B10		Step to pallet Bend to pallet Reach to part Grasp up part Gain control Raise part Stand up Face hand car Step to hand car Part onto hand car Let go part Face pallet
									Assist RH Assist RH		M12B10 RL1	34.0 18.8 2.0 18.6 221.3	W2P0 M12B10 RL1 TBC1		
3891	Hardware, unload handcar along right-of-way 910-SORHLO1								Assist RH Assist RH Assist RH Assist RH		R14B G1B G2 M10B10	14.4 3.5 5.6 17.4	R14B G1B G2 M10B10		To part on hand car Grasp part Gain control Lift part from car Turn from car Part to right-of-way Let go part Face hand car
									Assist RH Assist RH		M10B10 RL1	18.6 17.4 2.0 18.6 97.3	TBC1 M10B10 RL1 TBC1		
3892	Hardware, load on handcar along right-of-way 910-SORHLO1								Assist RH Assist RH Assist RH Assist RH		R10B G1A G2 M4B10	29.0 11.5 2.0 5.6 11.6	S R10B G1A G2 M4B10		Stoop to rail-bed Reach to part Grasp part Gain control Raise part Arise from rail-bed Face hand car Part to hand car Release part Turn from car
									Assist RH Assist RH		M4B10 M12B10 RL1	31.9 18.6 18.8 2.0 18.6 149.6	AS TBC1 M12B10 RL1 TBC1		
3893	Position tie plate pad	.0045	.0036	.0400	10	.0040	1	.0040							
3894	Move tie puller to next location, average of 5 ties	.0050	.0020	.0657	18	.0037	1	.0037							
3895	Spikes, distribute 910-WOMSD01								Include spikes Hold spikes Hold spikes	8	G2	29.0 103.2 16.0 44.8 103.2 16.0 6.0 6.0 16.8 31.9 119.0	S R12B G1A G2 M12A RL1 RFB G1A G2 AS W1P0 L2B	8 8 8 8 8 8 3 3 3 1 7 7	Stoop to pile of spikes Reach to spikes Pick up (1 to 3 spikes) Gain control Move to LH and place in LH Pick up 3 and hold in RH Straighten Walk and drop spikes To spike

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVES	LOW VALUE OBSERVES	NUMBER OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TRV	RM	NO.	DESCRIPTION - RIGHT HAND
3903	Carry heavy part from tool crib to truck location and return										G1A Wt/C	29.0 2.0 12.5 31.9 272.0 29.0	S G1A Wt/C AS W16P0 S		Stoop Grasp tool Pull to lift Arise Walk to truck location Stoop
											RL1	2.0 31.9 225.0 635.3	RL1 AS W15P		Release tool Arise Return to crib
3904	Load heavy tool onto truck and unload from truck										G1A MLB25	29.0 2.0 9.1 31.9 18.6 15.0	S G1A MLB25 AS TBC1 W1P		Stoop Grasp part Pull to lift Arise Step to truck
											M30B25 RL1	9.1 31.1 2.0 18.6 15.0 18.6 15.0	M30B25 RL1 TBC1 W1P TBC1 W1P		Lift over side of truck Release Return to parts
											R30B G1A	25.8 2.0 9.1	R30B G1A		Step to part on truck Reach to tool Grasp
											M30B25 RL1	31.1 18.6 15.0 29.0 2.0 31.9 379.5	M30B25 TBC1 W1P S RL1 AS		Lift Carry aside Lower to the ground Release Arise
3905	Pick up supplies and/or equipment and lay aside											18.6 150.0 29.0 18.6 3.5 10.6 5.6 31.9 18.6 75.0 29.0 18.6 2.0 10.6 31.9 37.2 180.0 29.0	TBC1 W10P S R20B G1B M3B G2 AS TBC1 W1P TBC2 W12P S		Turn Walk Bend Reach to object Grasp Lift Regrasp Arise Turn Walk to next object Turn Walk to "assembly" area Bend
									Bend Reach to object Grasp Lift Arise		B R20B G1A M3B AS				

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TBM	RH	NO.	DESCRIPTION - RIGHT HAND
3909	(continued)											0 45.4	R12		Release button
3910	Pull rope to start motor	.0010	.0005	.0030	4	.0008	1	.0008							
3911	Shut motor	.0015	.0005	.0040	4	.0010	1	.0010							
3912	Turn machine on or off											18.6 45.0 18.6 17.2 0.0 10.6 2.0 0.0 18.6 45.0 18.6 194.2	TBC1 W3P TBC1 R12B Q5 AP2 M1A R12 TBC1 W3P TBC1		Turn body Walk to end of machine Turn toward button Reach for button Grasp button Apply pressure Push button in Release button Turn body Return to work area
3913	Start or stop compressor	.0040	.0020	.0180	6	.0030	1	.0030							
3915	Put work gloves on hands and remove	.0050	.0045	.0095	2	.0048	1	.0048							
3916	Drill with hand electric drill and carbide core bit; hole 1/2" to 1" dia. hole in hard surface (per inch)	Study made on 22.5 inches of drilling a 1/2" to 1" dia. hole in hard material. Total time .4640 hrs. .4640/22.5 = .0206							1.0						.0206
3917	Drill with hand electric drill and carbide tipped core bit; 1/2" to 1" dia. hole in soft surface (per inch)	Study made on 18 inches of drilling a 1/2" to 1" dia. hole in soft material. Total time .0834 hrs. .0834/18 = .0046							1.0						.0046
3918	Drill with hand electric drill and carbide tipped core bit; 1" to 1 1/2" dia. hole in soft surface (per inch)	Study made on 150 inches of drilling a 1" to 1 1/2" dia. hole in soft material. Total time 1.0488 hrs. 1.0488/150 = .0070							1.0						.0070
3919	Drill with hand electric drill and carbide tipped core bit; 1" to 1 1/2" dia. hole in hard surface. (per inch)	Study made on .75 inches of drilling a 1" to 1 1/2" dia. hole in hard material. Total time .0194 hrs. .0194/.75 = .0259							1.0						.0259
3920	Drill a 3/8" dia. hole in concrete wall with an electric hand hammer and a star drill (machine time per inch)	Study made on 5 inches of drilling 3/8" dia. holes. Total time .0683 hours. .0683/5 = .0136							1.0						.0136

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THU	RH	NO.	DESCRIPTION - RIGHT HAND
3921	Check fuel, oil, cooling water and other gages before starting			.0113	1	.0113	1	.0113							
3922	Check boom operation, including brakes, clutches, governor control lever and stop control upon starting, or lock housing, secure brakes, disengage clutch and raise boom upon securing	.0097	.0030	.0278	6	.0046	1	.0046							
3923	Obtain and examine stub										R14B G1B R14B	14.4 3.5 14.6 58.4 3.4 1.7 90.0 90.0 276.0	MF M2C M2C M2C M2C M2C M2C M2C M2C	8 2/3 2/3 5 5	Reach stub Grasp Move stub to body Check stub Move pencil Cross out line Write on stub
3924	Fill out material "chit" and sign								a. Get chit pad from drawer			21.5 2.0 10.6 2.0 15.8 3.5 24.3 2.0 81.7	R24B G1A M2A R11 R16B G1B M30B R11		Reach to desk drawer Open drawer Reach for pad Grasp pad Move pad to desk top
									b. Get pencil from desk top			12.9 7.6 13.4 33.9	R12B G1A G2 M12B		Reach for pencil Grasp pencil Move pencil to pad
									c. Write 3 item stub chit			8.0 44.4 5.2 169.2 2.0 96.0 8.0 197.2 6.7	M4C P M M2C P M P M P M M3C	1 4 11 17 35 10 20 51 17	Move pencil to "obj. class" Write 3 digits Move to "Exp. Acct." Write 11 digits Move pencil to date Write date Move pencil to first line Write first line Move pencil to second line

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	RD	LN	TMU	RN	RD	DESCRIPTION - RIGHT HAND
3924	(continued)											83.2 6.7 M P M3C	22 7		Write second line Move pencil to third line
												128.0 6.7 M P M3C	36 10		Write third line Move pencil to signature
												121.6 13.4 2.0 894.3 M P M12B RL1	30 11		Write signature Lay pencil aside
									d. Remove "chit" from pad and give to carpenter			12.9 3.5 10.6 24.3 2.0 53.3 1063.2 R12B O1B M3B M30B RL1			Reach to "chit" Remove from pad Hand to carpenter
									e. Total						
3925	Insert stock number on, or sign stub requisition								Reach stub		RR G5	12.9 7.6 15.2 160.0 13.4 2.0 11.8 222.9 R12B O1A-O2 M12C W11 M12B RL1 M12E			Reach for pencil Grasp & regrasp Move to paper
									Grasp					10	Write
									Release paper	RL2					Move pencil to pocket Release Return hand
3926	Sign instruction sheet after job											39.2 36.0 16.8 14.0 39.2 46.0 191.2 P M P M P M	7 18 3 7 7 23		"John" "H" "Duffy"
3927	Waiting time for air pressure to increase and decrease	.0030	.0007	.1005	5	.0209	1	.0209							
3928	Pre-planning on average emergency/service call								Computation of planning associated with job preparation-- observed during delay studies Allowance computed 1.47 Allowance established 1.43 Average call 1.4 hours						

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LN	TMU	RM	NO.	DESCRIPTION - RIGHT HAND
3928	(continued)								$\frac{1.40}{1.43} - \frac{1.40}{1.47} = .034 \text{ hrs}$						
3929	Get check from ring and return check to ring								Reach to ring	R10D		12.9			
									Grasp	(05) (M)B		2.0			
									Move check from ring	(02) M4C		5.6			
												8.0			
												12.9	R12B		Reach to check
												3.5	G1B		Grasp
												22.1	M20C		Move to ring
												16.2	P25E		Position on ring
												4.6	M2B		Move on ring
												2.0	RL1		Release
												89.8			
3932	Pick up carrying bag and set down											30.0	W2P		Walk to bag
												29.0	B		Bend down
												2.0	G1A		Grasp
												12.5	AP35		Pull
												31.9	AB		Arise with bag
												5.6	G2		Regrasp bag
												43.2	M20C35		Move to shoulder
												5.6	G2		Regrasp strap to release
												2.0	RL1		Release
												13.1	R20A		Reach to strap
												2.0	G1A)		Grasp
												5.6	G2)		Grasp
												37.8	M20B35		Lift bag from shoulder
												29.0	B		Bend
												2.0	RL1		Release strap
												31.9	AB		Arise
												283.2			
3933	Move equipment or material aside at job site and move back after job											18.6	TBC1		Turn toward equipment
												30.0	W2P		Walk to equipment
												29.0	B		Bend
									Grasp	G1A		2.0	G1A		Grasp equipment
									Apply pressure	AP1		16.2	AP1		Apply pressure
												31.9	AB		Arise
												68.0	W4P0		Walk to site
												29.0	B		Bend
									Release	RL1		2.0	RL1		Release equipment
												31.9	AB		Arise
												18.6	TBC1		Turn
												45.0	W3P		Walk
									Reach to equipment	R20B		18.6	R20B		Reach to equipment
									Grasp	G1A		2.0	G1A		Grasp
									Move equipment	Wt/C		9.1	Wt/C		Weight const. only
												34.0	W2P0		Walk
												9.1	Wt/C		Walk
									Lay equipment down	M10B25		15.6	M10B25		Lay equipment down
									Release	RL1		2.0	RL1		Release
												412.6			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3934	Attach pipe machine to rear of truck for towing and detach at destination											18.6	TBC1		Turn toward pipe machine
												30.0	W2P		Walk
												29.0	S		Stoop
												2.0	G1A		Grasp
												5.6	Wt.		Weight constant
													Const.		
												31.9	AS		Arise
												16.2	AP1		Apply pressure
												136.4	SSC2		Side step to side
												37.4	M2OC25		Move tongue
												11.2	P18D		Position tongue
												11.5	R10B		Reach for chain
												2.0	G1A		Grasp
												16.2	AP1		Apply pressure
												8.1	MCA		Move chain
												2.0	RL1		Release
									Detach at destination is the same except for only 2 SSC2 and no P18D. The motions occur in a different order.			278.7			
												636.8			
3935	Move heavier tools or equipment to truck location. Move from truck location to job site											270.0	W18P		Walk to tool
												29.0	O		Bend down
										G1A		2.0	G1A		Grasp tool
										AP25		9.1	AP25		Pull to lift
												31.9	AS		Arise
												270.0	W18P		Walk outside
												29.0	S		Stoop
												2.0	RL1		Release
										RL1		31.9	AS		Arise
												600.0	W40P		Walk to tools
												29.0	S		Stoop down
												2.0	G1A		Grasp tool
												9.1	AP25		Pull to lift
												31.9	AS		Arise
												630.0	W40P		Walk inside
												29.0	S		Stoop
												2.0	RL1		Release tool
												31.9	AS		Arise
												2009.8			

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO	DESCRIPTION - RIGHT HAND
3940	Part, pick up and set down U-MOHPP01								Grasp other end Pull	G1A APB		29.0 2.0 17.2 2.0 16.2 31.9 29.0 2.0 17.2 2.0 31.9 180.4	S G1A M5B10 APB AS S RL1 AS		Stoop Grasp one end Lift one end Lift part Stoop with part Release part Arise

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVEL TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RM	NO.	DESCRIPTION - RIGHT HAND
3942	Slide or push heavy object near and return (2 men) - elapsed time	.0210	.0111	.0710	5	.0142	1	.0142							
3944	Obtain hand box - replace											18.6 29.0 18.6 2.0 34.0 5.6 39.2 2.0 31.9 18.6 29.0 2.0 39.2 24.1 2.0 18.6 0 24.1 0 31.9 370.4	TBC1 B R20B G1A M30B15 G2 M20A35 RL1 AB TBC1 B R20B G1A M20A35 M16B15 RL1 R20B O2 M16B15 RL2 AB		Step to box Bend Reach Grasp handle Move to edge of shelf Regrasp handle Move to floor Release Arise Step to box Bend Reach Grasp Lift to shelf Slide on shelf Release Reach for end Grasp Push in Release Arise
3945	Obtain tool box from shelf and return											18.6 29.0 18.6 2.0 27.0 5.6 28.6 5.6 42.2 2.0 31.9 18.6 29.0 18.6 2.0 18.6 47.2 19.9	TBC1 B R20B G1A M10B32 G2 M12B32 G2 M22A40 RL1 AB TBC1 B R20B G1A R20B G1A M22A50 M10B16		Step to tool box Bend Reach Grasp Move - pull toward edge of shelf Regrasp handle Move - pull off shelf Regrasp handle Move to floor Release Arise Step to tool box Bend Reach for handle Grasp Lift tool box, place on shelf edge Slide box on shelf
									Reach to end of box		R20B				
									Grasp edge		G2				
									Move to floor		M22B40				
									Release		RL2				
									Reach for box end - grasp		R20B G1A				
									Assist in lifting		G2 M22A50				
									Push		M10B16				

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LM	TMU	RH	NO	DESCRIPTION - RIGHT HAND
3945	(continued)								Push		M12B16 RL2	2.0 18.6 0 21.3 31.9 438.8	RL1 R20B G5 M12B16 RL2 AB		Release Reach for end Grasp Push in rest of way Release Arise
3947	Move tools or material on job site	.0700	.0020	.3930	30	.0131	1.0	.0131							
3948	Put hose in pick up (per section)	.0071	.0043	.0114	2	.0057	1.1	.0063							
3949	Finish sand one square foot											10.6 966.0 976.6	AP2 M15B	64	Apply pressure Move block back and forth
3950	Pick up material or tools - set down after moving them								To material Grasp Lift material Regrasp material		R20B G1A M20B70 G2	29.0 2.0 18.6 2.0 29.6 5.6 31.9 37.2	S G1A 40520 M20B70 G2 AS TBC2		To material Grasp Lift material Regrasp material Arise with material Turn to walk Walk to work site Walk back to material To set down
											RL1	29.0 2.0 8.4 5.6 31.9 18.6 251.4	S M4B70 G2 RL2 AS TBC1		To set on floor Arise from stoop To walk
3952	Hand crank gas starter motor for diesel (cold starting)			.0330	1	.0330	1	.0330							

[illegible]

ELEM- ENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL- ING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LH	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
3964	(continued)								Phone to receiver			833.4			Complete phone connection
									Position phone			-	R20E		Hand aside
									Release phone			30.7			
												9.1			
												2.0			
												1119.0			
3965	Remove or replace tarpaulin on material pile											45.0	W3P		To material pile
												29.0	B		Bend
												10.1	R8B		To weight on tarp.
												2.0	G1A		Grasp weight
												31.9	AB		Arise
												13.6	MCB10		Aside weight
												2.0	RL1		Release weight
												18.6	TBC1		Turn
												30.0	W2P		To 2nd weight
												29.0	B		Bend
									To second weight			10.1			
									Grasp weight			2.0			
												5.6	G3		To right hand
												21.4	M16B10		Aside weight
												2.0	RL1		Release
												31.9	AB		Arise
												30.0	W2P		To 3rd weight
												29.0	B		Bend
												10.1	R8B		To third weight
												2.0	G1A		Grasp weight
												21.5	M20B5		Aside weight
												2.0	RL1		Release
												31.9	AB		Arise
												18.2	S314C1		For position
												29.0	B		Bend
									To corner of tarp.			6.4	R4B		To corner of tarp.
									Grasp corner			2.0	G1A		Grasp corner
												31.9	AB		Arise
												19.9	M10B15		Fold tarp back
												2.0	RL1		Release
												18.6	TBC1		Body balance
												30.0	W2P		Walk
												18.2	S314C1		Position body
												29.0	B		Bend
									To corner tarp.			6.4	R4B		To corner of tarp.
									Grasp corner			2.0	G1A		Grasp corner
												31.9	AB		Arise
									Move tarp back			22.3	M10B20		Move tarp back
												15.0	W1P		Walk
									Throw tarp aside			22.3	M10B20		Throw tarp aside
												2.0	RL1		Release
												16.7	R20E		Hands aside
												734.7			

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ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY						METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	THU	RN	DESCRIPTION - RIGHT HAND
3966	Tripod (with vise), set up to use U-MVST001								Lower hand on vise	M14B50		30.2	M12B20	Position vise with legs down
										RL1		2.0		
										R09		10.1		
										G1A		2.0	RL1	Release vise
												29.0	B	Bend
												12.9	M12B	Reach to leg of vise
										(M2)		7.3	G1C1	Grasp leg of vise
										APB		32.4	APB	
												9.2	M2B	
												11.2	O2	
												38.4	M20A	Open two legs of vise
												4.0	RL1	Release leg of vise
												37.2	M20B	Reach back to leg of vise and grasp
												4.0	G1A	
									Release vise	RL1		2.0		
									Reach to vise leg	R09		8.6		
									Grasp	G1A		2.0		
									Open 3rd leg	APB		16.2		
										M22A		20.8		
									Release leg of vise	RL1		2.0	RL1	Release leg of vise
									Set up vise			31.9	AB	Arise
												313.4		
3967	Floor brush, clean											18.6	TBC1	Turn to brush handle
												30.0	V2P	Step to handle
												21.5	M24B	Reach to handle
												2.0	G1A	Grasp handle
									Reach for brush end of handle	(R14A)		20.2	M18B5	Lift floor brush toward body
									Grasp handle	(G1A)		5.6	O2	Regrasp
									Up-end brush	M40B5		34.3	M40B5	Up-end brush
									Regrasp handle	O2		5.6		
												2.0	RL1	Release handle
												15.8	R16B	Reach to nail brush
												2.0	G1A	Grasp nail brush
												20.6	M24B	Move nail brush to brush head
												5.6	O2	Regrasp nail brush
												340.0	M26C	Comb dirt out of bristles
												433.2	M26C10	

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	EVELED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TW	RH	NO.	DESCRIPTION - RIGHT HAND
3967	(continued)											20.6	M24B		Move nail brush to shelf
												2.0	RL1		Release nail brush
												13.1	R20A		Reach to brush handle
												2.0	G1A		Grasp handle
									Release handle	RL1		2.0			
									Reach for lower grip on handle	R26A		15.8			
									Grasp handle	G1A		2.0			
									Move bristles to floor	M40B5		34.3	M40B5		Move bristles to floor
												5.6	G2		Bend body
									Regrasp handle	G2		5.6			Regrasp handle
												58.2	M6A	6	Strike brush
												63.6	AP1	6	Against floor
												80.6	M25W	6	Lift brush off floor
									Release handle	RL1		31.9	AB		Arise bend
												30.0	W2P		Step to walk
												20.9	M12A5		Move brush to wall
												2.0	RL1		Release
												18.6	TBC1		Turn from wall
												1373.8			
3968	Verbal instructions 'get from supervisor	.1333	.0500	.9689	8	.1211	1.00	.1211							
3969	Dust mop; attach and remove treated cloth											90.0	W6P		Walk with cloth to dust mop
												18.6	TBC1		Turn to dust mop
									Reach to cloth	G1A		14.4	M14A		Move cloth to unfold
									Grasp	G1A		5.6	G2		Regrasp
									Unfold cloth	M14B		14.6	M14B		Unfold cloth
									Release cloth	RL1		2.0			
									Reach to top of mop handle	R24B		30.0	W2P		Step to dust mop
									Grasp mop handle	G1A		2.0			
									Insert top of mop handle into sleeve	M12C		30.0	W2P		Step back
												15.2	M12C		Insert open end of cloth sleeve over mop handle
												18.7	M16C		Pull center hole in sleeve over end of mop handle
												2.0	RL1		Release cloth
												11.4	R16A		Reach to top of mop handle
												2.0	G1A		Grasp handle
									Let go handle	RL1		2.0			
									Reach to sleeve	R16B		15.8			
									Get hold sleeve	G1A		2.0			
									Pull sleeve down over handle	M32B		25.5			

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELING TIME	DESCRIPTION - LEFT HAND	NO.	LN	TNU	RN	NO	DESCRIPTION - RIGHT HAND
3969	(continued)								Get hold handle		G1A	2.0 2.0 17.5	RL1 R30A		Let go top of handle Reach to center of handle Get hold handle
									Let go sleeve and handle		RL1	2.0 2.0	G1A		
									Reach for end of dust mop		R32A	29.0	B		Bend
									Get hold end of dust mop		G1A	2.0			
									Swing up against mop handle		M4A	14.4			
									Let go end of dust mop		RL1	2.0			
									Reach to sleeve		R20B	18.6			
									Get hold sleeve		G1A	2.0			
									Pull sleeve over dust mop		M36A	33.5			
									Let go sleeve		RL1	2.0 31.9 18.6 60.0 17.6	AB TBC1 W4P M18A		Stand straight Turn to wall Walk to wall Lean dust mop against wall
												2.0 18.6 60.0 661.0	RL1 TBC1 W4P		Let go handle Return to work area
												661.0 1322.0			Total; attach cloth to dust mop Remove Total; attach and remove
3970	Brush, mount and remove from floor polisher											21.5 2.0	R24B G1A		Reach for brush Grasp
									Reach brush		R12A	25.9	M24A7.5		Move
									Grasp		G1A	2.0			
												20.0 7.3 16.8	ET EF G2		Turn over brush
									Turn over brush			2.0			
									Release brush		RL1	37.2 31.0 14.4	TBC2 W3P0		Turn body to walk to buffing machine
									Reach handle		R14B	2.0			
									Grasp		G1A	29.0	B		
									Tilt handle		R11 R16B	14.3 18.9	LM12 M16B7.5		
												7.7 14.7 10.7 10.6 2.0	M2C7.5 P18SD M5B7.5 AP2 RL1		Position brush Tighten brush Release

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHOD ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4001	Give check to stock clerk and obtain check after use from clerk								Move check to clerk		M20B	18.2 11.5 5.6 60.0 37.2 18.2	R10B O3 WAP TDC1 M20B	2	Clerk reaches Clerk grasps Clerk walks with used check Clerk moves check to opr.
									Reach for check Grasp check Move to counter Release		R10B O3 M12B RL1	11.5 5.6 13.4 2.0 183.2			
4005	Dial supervisor on telephone								Move finger to dial Position finger Dial number Lift finger Wait for dial Move finger to dial		M20C P1SE M4A R1E M1C	18.6 2.0 30.7 22.1 16.8 18.3 6.0 75.0 4.0 30.7 9.1 2.0 235.3	R20B O1A M30C P1SSE RL1		Reach for phone Grasp phone Move to ear Move phone to hook Position phone in hook Release phone
4010	Place ground wire in place or remove								Place groundwire			18.6 15.0 29.0 7.3 31.9 18.6 150.0 29.0 2.0 31.9 333.3	TBC1 W1P B G1C1 AB TBC1 W1OP B RL1 AB		Turn body Walk to wire Reach for wire Grasp wire Arise with wire Turn body Walk to work Lay wire on work Release wire Arise
4011	Torch: Change tip (includes removing old tip and installing new tip)								Reach to torch Grasp torch Move torch to work area		R10B G1A M10B	90.0 17.2 2.0 17.0 2.0 16.2 69.0 30.0 60.0 30.0	W6P R10A G1A AP1 M2B RL1 R2B G1A	15 15 15 15	Walk to & from torch tips box Reach to torch tip Grasp tip Screw off tip

SYNTHESIS						
NO	OPERATION ELEMENT DESCRIPTION	HAND 1 2	TIME ELEMENT NUMBER	ESTIMATE TIME	FREQUENCY	REMARKS
8034	Remove and reassemble ball, roller, or sleeve bearing from shaft, and rotor or armature. Wire brush, clean and inspect motor.					.1392
1	Remove ball, roller or sleeve bearing from shaft or end shield		8013	.0231	2	.0462
2	Inspect and check bearing before assembly		8032	.0075	2	.0150
3	Carry rotor or armature to lathe, position in chuck, tighten chuck		2763	.0077	1	.0077
4	Wire brush rotor or commutator while turning in lathe		864	.0100	1	.0100
5	Adjust platform on hydraulic press to correct level		3507	.0031		.0031
6	Carry components to cleaning booth, hydraulic press or test panel		2759	.0095	2	.0190
7	Install bearing on shaft or to end shield on hydraulic press		8013	.0231	2	.0462
8	Inspect or check bearing assembly		2580	.0028	4	.0112
8035	Take motor to test panel, prepare to test, test and reassemble					.2569
1	Install screw to hold end shield		8000	.0045	8	.0313
2	Cut friction tape from motor leads		941	.0045	3	.0135
3	Strip end of motor lead		835	.0045	3	.0135
4	Carry components to cleaning booth, hydraulic press or test panel		2759	.0095	2	.0190
5	Attach motor lead to test panel lead		850	.0014	3	.0042
6	Run motor, listen to bearings through steel rod at start or after run in period		845	.0135	2	.0310
7	Attach test meter leads to motor leads and test for ground and short circuit		898	.0108	3	.0324
8	Position cover plate to motor junction box		8005	.0020	1	.0020
9	Install screw to hold cover plate		8000	.0045	2	.0078
10	Remove or reinstall armature brush		8010	.0131	4	.0324
8036	Skin end of wire (2 wires)					.0129
1	Remove tool from belt kit and return		928	.0012	2	.0024
2	Open and close knife		3174	.0011	1	.0011
3	Skin end of wire		835	.0046	2	.0092
8037	Pig tail splice - 2 wires					.0210
1	Skin end of wires		8036	.0129	1	.0129
2	Twist wires with pliers, per revolution		2657	.00103	7	.0074
3	Cut off wire end		954	.0007	1	.0007
8038	Tee type splice - 2 wires					.0174
1	Skin end of wires		8036	.0129	1	.0129
2	Position wires for splicing		252	.0005	1	.0002
3	Twist wires by hand, per revolution		2659	.00022	6	.0031
4	Band twisted wire splice down		871	.0009	1	.0009

ELE- MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA- TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO. FACTOR	LEVELED TIME	DESCRIPTION - LEFT HAND	NO.	LM	TMU	RH	NO.	DESCRIPTION - RIGHT HAND
4096	(continued)								Regrasp top of left loop		G2	5.6			
									Twist outward		T180°	9.4	T180°		Twist outwards forming 2 twists in loops
									Hold			4.0	RL1	2	
									(Repeat from look)			14.0	R6A	2	Reach both loops
												4.0	G1A	2	
												31.6	M16B	2	Place on crane hook
												12.2	M10B		Draw up tight
												16.2	AP1		
												2.0	RL1		
												152.1			
4099	Move blind to finish table								To blind		R16B	15.8	R16B		To assembled blind
									Blind		G1A	2.0	G1A		Blind
									Off table		M10B	12.2	M10B		Off table
												37.2	TBC2		Away from table
												75.0	W5P		To end of table
												18.6	TSC1		Around corner
												45.0	W3P		To finish table
									Blind on table		M16B	37.2	TBC2		To table
									On table		RL1	17.0	M16B		Blind on table
												2.0	RL1		On table
												262.0			
4100	Set up 16 ft. extension ladder; adjust and take down ladder (2 men)	.0640	.0540	.1180	2	.0590	1	.0590							
4101	Mirror, clean per sq. ft.	.0016	.0009	.0075	6	.0013	1.00	.0013							
4104	Vise (bench), open and close (1/4 inch) U-MVSVCO1											11.5	R10B		Reach to vise handle
												2.0	G1A		Grasp handle
												16.2	APB		Pull or push handle
												58.4	M14B	4	Turn handle
												8.0	RL1	4	Release handle
												43.2	R14B	3	Reach to other end of handle
												6.0	G1A	3	Grasp handle
												11.5	R10B		Reach to vise handle
												2.0	G1A		Grasp handle
												16.2	APB		Pull or push handle
												58.4	M14B	4	Turn handle
												8.0	RL1	4	Release handle
												43.2	R14B	3	Reach to other end of handle
												6.0	G1A	3	Grasp handle
												290.6			
4105	Turn screw 360 degrees											6.0	M2B	3	Turn screw with fingers
												6.0	RL1	3	Let go screw

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	AM	NO	DESCRIPTION - RIGHT HAND
4105	(continued)											6.0 6.0 24.0	RFB G1A	3 3	To screw Grasp screw
4106	Move and set up 20' extension ladder - average move 26' (lamp spacing 20')								Lower hand to ladder Grasp ladder low Hold ladder	R5B G1A G2		85.0 17.2 2.0 5.6 16.2 35.0 34.0 17.4 5.6	W5PO R18B G1A G2 AP1 M20B30 W2PO M10B10 G2		Get into position Raise hand to grasp Grasp ladder high To pull ladder Pull ladder top out Pull ladder up right Back ladder upright Pull ladder over To slip hands to center
									To slip hands to center	G2		68.0	W4PO		Step to center of ladder
									Assist right hand Assist right hand	G2 M16B16		5.6 37.1	G2 M16B40		Grasp ladder to carry Position ladder to carry
									Hold Assist right hand	M10B40		170.0 52.5 31.9 68.0	W10PO M30B50 M10B40 W4PO		Carry ladder to fixture Raise top of ladder Raise entire ladder Position ladder to fixture
									Assist right hand Same as right hand Same as right hand	M10B30 RL1 R10S		27.2 2.0 16.7 697.0	M10B30 RL1 R20E		Ladder to rest Let go ladder Hands to side
4107	Signal - give and recognize	.0010	.0006	.0041	5	.0008	1.0	.0008							
4108	Carry pail to and from, and turn faucet on and off											18.6 29.0 2.0 18.2 31.9 18.6 450.0 18.6 18.6 18.6 8.0 32.4 16.8 8.0 6.0 6.0 500.0 31.9 18.6 450.0 18.6 29.0 2.0	TBC1 B G1A M20B AS TBC1 W3OP TBC1 R20B G1A AP1 M2B RL1 R2A G1A PT AS TBC1 W3OP TBC1 B RL1		Turn to bucket To bucket Grasp handle Lift Arise Turn to faucet Walk to faucet Face faucet Reach to faucet Open and close faucet Fill bucket Arise with bucket Turn from faucet Return to pail Turn to pail Lower bucket Let go

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL PMS FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4123	Wipe machine table, vise, surface gage, or square								Reach to table Lay hand on table Slide hand on table To clean	6	R18B G5 M8B RL2	17.3 0 63.6 0 80.8			
4124	Position part or fixture against stop (each stop)								Left hand may follow pattern of right hand			8.6 2.0 16.2 6.1 2.0 34.9	R6B G1A AP1 H4A RL1		Reach to part Grasp part Move part Against stop Release part
4125	Pick up and lay aside medium part								Left hand may follow same pattern as right hand			14.4 2.0 13.8 5.6 17.4 5.6 16.7 2.0 77.5	R14B G1A M6B10 G2 M10B10 G2 M9B10 RL1		Reach to part Grasp Move part Regrasp Move to fixture Regrasp Lay part aside
4126	Retighten vise by hand								Reach to handle Tighten Release		R24A G1A M2B AP2 RL1	14.9 2.0 4.6 10.6 2.0 34.1	R24A G1A M2B AP2 RL1		
4127	Measure, mark with pencil - using a pattern (per sign)											21.5 2.0 4.0 20.6 8.0 64.8 40.2 9.2 25.5 5.2 16.0 2.0 219.0	R24B G1A D1E M24B M2C P2SE M12B M2B M24C M2C P1MSD RL1	4 4 3 2	Reach to pencil Grasp pencil Remove pencil Move to work surface Move pencil for pre-positioning Positioning of pencil Move to make mark Move to make mark Move pencil to pocket Move pencil into pocket Position clip Release
4128	Vise - close and open vise on object								Close			18.6 2.0 4.0 0 56.3 0	R20B G1A R2B G5 M10A RL2	5	Reach to handle Grasp handle Reach to handle to spin Grasp handle Spin handle Release

ELEMENT NO	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LH	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4128	(continued)								Open			2.0 G1A 16.2 AP1 13.6 AP2 3.6 M2A 2.0 RL1 115.5			Grasp handle Apply pressure to handle Tighten handle Release handle
												18.6 R20B 2.0 G1A 16.2 AP1 10.6 AP2 4.6 M2B 2.0 RL1 4.0 R2B 2.0 G5 56.5 M12A 2.0 PL2 114.5			Reach to handle Grasp handle Apply pressure Move into position to spin Release handle Reach to handle for spin Grasp handle for spin Spin handle Contact release
									Close vise			115.5			
									Open vise			114.5 730.5			
4129	Adjust vise as necessary (open or close)											21.2 R8B 4.0 PL1 10.1 R8B 2.0 G1A 16.2 AT1 53.5		2 3	Turn handle Release handle Reach to handle Grasp Apply pressure
4130	Position small object (2 x 12 x 1/2 plastic) between two wood blocks and place in 4" vise and remove from vise (per sign)								Reach to sign	R12B		12.9	R12B		Reach to first wood block
									Grasp	G1A		1.0	G1A		Grasp
									Similar to R.H.	M12C		15.2	M12C		Bring parts together
									Reach to 2nd block	R12B		12.9	G2		Regrasp
									Grasp	G1A		2.0			
									Place other block over plate	M12C		15.2			
									Transfer grasp	G3		5.6			
												16.2	AP1		Apply pressure to hold plate between blocks
												15.2	M12C		Move to vise
												9.1	PLSSE		Place blocks in vise prior to tightening
												2.0	RL1		Release
												12.9	R12B		Reach to blocks and sign in vise
									Reach to block and sign			2.0 G1A 12.9 M12A			Grasp Move to L.H.
												5.6 G3 5.6 G2			Transfer to L.H. Regrasp sign

ELEMENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVATIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVELING FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO.	LN	TMU	RN	NO.	DESCRIPTION - RIGHT HAND
4130	(continued)								Set blocks down Release		R6B RL1	8.6 2.0 <u>157.9</u>			
4131	Position tool to work								L.H. same as R.H.	2	M18C10 M18C10 P2SD M6B5	26.5 12.2 21.8 11.6	M18C13 M18C10 P2SD M6B5	2	Move to part Move tool to point Position to point Straighten
										2	MFC G2	21.9 4.0 5.6 <u>103.6</u>	EF MFC G2	3 2	Align. Regrasp handles
4132	Caliper, use, spring inside caliper, dimension up to 8 inches U-BITCU01											12.2 4.9 6.7 21.6 2.9 5.6 4.0 2.0 266.0 12.0 12.0 10.0 10.0 11.2 6.0	M10B M3A M3C P2SD M1B G2 R2B G1A P2NSD MFC RL1 RFB G1A G2 MFC	10 6 6 5 5 5 5	Move caliper to part Move one leg to dia. of bore Move other leg to bore Position leg in bore Move calipers into bore Regrasp caliper Reach to spring nut Grasp spring nut Feel for size Adjust calipers Regrasp calipers Move calipers to end of bore
4133	Caliper, use, spring outside caliper, dimension up to 8 inches U-BITCU02											5.7 12.2 <u>405.2</u> 12.2 4.9 6.7 5.6 4.0 2.0 266.0 8.0 8.0 6.0 6.0 11.2 4.0	D1D M10B M10B M3A M3C G2 R2B G1A P2NSD MFC RL1 RFB G1A G2 MFC	10 4 4 3 3 2 2	Remove calipers from bore Move calipers from part Move caliper to part Move one leg to dia. of part Move other leg to dia. Regrasp caliper Reach to spring nut Grasp spring nut Feel for size Adjust calipers Regrasp calipers Remove calipers from part
												5.7 12.2 <u>562.5</u>	D1D M10B		Move calipers from part

ELE. MENT NO.	DETAILED ELEMENT DESCRIPTION	TIME STUDY							METHODS ANALYSIS CHART						
		HIGH VALUE OBSERVED	LOW VALUE OBSERVED	SUM OF OBSERVA TIONS	TOTAL NO. OF OBS.	AVERAGE OR SELECTED	LEVEL NO FACTOR	LEVELLED TIME	DESCRIPTION - LEFT HAND	NO	LN	TMU	RH	NO	DESCRIPTION - RIGHT HAND
4148	(continued)											27.0 2.0 31.9 277.9	M3080 RL1 AR		Let to floor Release Arise
4149	Bar (claw), drive on spike with maul, each additional stroke 910-BTLD02										M1005 PISE M1005	16.5 5.6 15.1 37.2	M1005 PISE M1005		Hit claw bar with care Align maul Raise maul
4150	Jack, place under rail and tighten, raise jack each additional stroke 910-MTLJPO2											16.2 16.2	M6A		Move up and down to tighten against
4151	Spikes, distribute, per spike 910-MOHS02								910-MOHS01 (16 spikes)			491.9 16			30.7 TMUs per spike
4152	Work, run on joister											67	CT		Per foot
4153	Joister, adjust to required table height, each addi- tional adjustment of joister 667-MBUJA02											7.3 1.0 2.6 7.3 1.0 7.2 1.0 4.0 2.6 7.3 41.5 2 83.0	R14B G1A M2C EF M2C RL1 R14B G1A M3C	1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	To move adjusting wheel If cut is not correct Back to board Check measurement